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REPORT

ON THE

INVERTEBRATA OF MASSACHUSETTS,

PUBLISHED AGREEABLY TO AN ORDER OF
THE LEGISLATURE.

SECOND EDITION, COMPRISING THE MOLLUSCA.

BY

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PREFACE

BY THE EDITOR.

In 1841 there was published agreeably to an order of the Legislature a Report on the *Invertebrata* of Massachusetts, comprising the *Mollusca*, *Crustacea*, *Annelida*, and *Radiata*, by Dr. A. A. Gould. In 1865 the Legislature directed a new and revised edition of the work to be published by Dr. Gould. The rapid progress that was making in preparing this new edition was interrupted in 1866 by the death of the author. In 1867 the Legislature authorized the Governor and Council to appoint some person to complete the work, and the choice fell on me.

Upon assuming the charge of the publication and receiving the manuscripts, drawings, notes, &c., of Dr. Gould, I endeavored to learn thoroughly what plan he had made for revising the first edition, as I was directed to complete the work *as nearly as possible in accordance with the views and wishes of the author*. I believe I have been able to arrive at a clear idea of his intentions, which, according to my orders, I have most scrupulously endeavored to carry out, irrespective of my own opinions. It is only in treating the *Pulmonifera* that I have exercised my own judgment, and here only to the extent that I believe Dr. Gould would have approved. Under the descriptions of the various larger systematic divisions, I have given notes showing more particularly my share in the composition of their respective portions of the text.

Dr. Gould intended to reprint the copperplates of the original edition, and to give woodcuts of the additional species. He had prepared figures of the species of *Teredo* and *Astarte* alone, and as his own collection had been sold and removed from Boston, I was obliged to obtain for figuring specimens from other sources. I nat-

urally turned to the Museum of Comparative Zoölogy at Cambridge as our richest depository of Natural History, and was not disappointed in finding a valuable collection of New England Shells. Professor Agassiz kindly put these at my disposal, and Mr. J. G. Anthony spared no pains to assist me in selecting specimens for figuring. The Museum of the Peabody Academy at Salem also furnished a large number of specimens, which were drawn on wood by Mr. E. S. Morse with his usual accuracy. I am indebted also to Mr. Morse for the identification of most of the smaller and more difficult species, and to him, indeed, belongs almost the entire credit of the illustrations in the text.

I was unable to carry out Dr. Gould's plan of reprinting the original copperplates, as they were not to be found. I thought it best to have new figures drawn on wood rather than reproduce the old ones. This fact will account for the frequent discrepancies between the descriptions and figures, especially as regards measurements, as the specimens selected by me for figuring are often larger and finer than those from which Dr. Gould drew his descriptions.

Most of these woodcuts were engraved by Mr. Henry Marsh, so well known for his beautiful illustrations of "Harris's Insects."

Dr. Gould had prepared for engraving many beautiful drawings of *Nudibranchiata*. Professor Agassiz has added largely to these, and also has furnished many drawings of *Tunicata* and *Cephalopoda*. These I have grouped into plates which have been printed by chromo-lithography, by Messrs. Bowen & Co., of Philadelphia, in a most creditable manner.

I have retained the references to the figures of the original plates and have continued from them the numbering of the figures in the new edition, first in the plates, and then in the text. The numbering of the plates in this edition commences with XVI., thus allowing for the fifteen original copperplates, although they were not numbered.

In addition to the gentlemen named above, and in various notes throughout the text, I am indebted to Dr. W. Stimpson and Dr. P. P. Carpenter for valuable assistance in preparing the work.

On account of the incompleteness of Dr. Gould's manuscript, and

the great expense of illustrations, I have been obliged to omit the *Bryozoa*, and the *Radiata*, *Crustacea*, and other branches of *Invertebrata* included in the first edition.

Should any disappointment be felt that Dr. Gould has not adopted in his work all the improvements in classification, &c., which more recent investigations have suggested, it must be remembered that this is not a new work. It is rather a reprint of an old one, with such additions and improvements as Dr. Gould considered absolutely necessary to its present usefulness.

In closing my Preface I must refer to the peculiar pleasure I have taken in being able, in some slight manner, to repay the encouragement, assistance, and constant kindness of the author to myself, in my conchological studies, and especially to return the similar service which has already united the names of Gould and Binney in authorship.

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INVERTEBRATA OF MASSACHUSETTS.

Class TUNICATA.*

ACEPHALOUS Mollusks with a soft, organized, coriaceous or gelatinous shell or test provided with a branchial and an anal orifice. Mantle forming an interior coat. Gills attached wholly or partly to the internal surface of the mantle. Mouth without labial tentacles, placed below the gills. Animals single or aggregate, fixed or free, hermaphrodite, undergoing a metamorphosis in their young state.

The Tunicaries are entirely marine, and are very numerous in all parts of the world; adhering to rocks and sea-weed, their strange, bag-shaped, leathery bodies may be seen along the strand at low-water, ejecting, when touched, the sea-water to some distance; and on the ocean their lengthened sinuous chains, or pellucid phosphorescent tubes, cannot fail to arrest the eye of the voyager. The compound forms exhibit, in the varied arrangement of the individuals

* Finding nothing in Dr. Gould's manuscript relating to the Ascidians, and being myself unacquainted with the class, I could but collate the few published descriptions of species, and obtain what drawings had been made by those who have collected the animals. Through the kindness of Professor Agassiz, the rich treasures of the Museum of Comparative Zoölogy have been laid open to me, furnishing many figures beautifully drawn from nature by Mr. Burkhardt. Dr. Packard has also given the use of the species collected by him, from which Mr. Morse has drawn Plate XXIII. as correctly as is possible from specimens long preserved in alcohol.

To Mr. Alexander Agassiz I am indebted also for the use of the woodcuts of *Salpa*.

The descriptions of families, genera, &c., are copied from "The Genera of Recent Mollusca." I have included all species actually described as having been found from New York to Labrador. A reference to the "Bibliography of North American Conchology" will show that species have been mentioned by name as inhabiting New England which are not included in the following pages. They are not accompanied by descriptions.

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composing the general mass, a number of stars and flowers of curious and complicated design. Towards the Northern shores they are sombre in their colors, but in the sunny regions of the South their hues assume the brightest dyes, and vie with those of the corallines and *Actiniæ* that people the bed of the ocean. It was in the Ascidian Tunicaries that MM. Audouin and Milne-Edwards first discovered the metamorphoses of the Mollusca, and their discoveries have been since extended by the laborious researches of Sars and Lovén.

It was among these singular beings that Van Hasselt discovered "a heart of such extraordinary character, changing incessantly its auricle to ventricle and its ventricle to auricle, its arteries to veins and its veins to arteries." Among the Salpian Tunicaries it was, moreover, that Chamisso made the no less extraordinary discovery that "a *Salpa*-mother is not like its daughter or its own mother, but resembles its sister, its granddaughter, and its grandmother." The Pyrosomes afford to the naturalist, when seen by myriads from the vessel in the night, a spectacle of unexampled beauty: they gleam with phosphorescent radiance, forming vast shoals of mimic pillars of fire, illuminating all around with a green, unearthly glare. The most curious feature, however, in the history of these soft-shelled Mollusks is the fact that many among them form communities of beings like the Corals,—"a commonwealth of beings bound together by common and vital ties. Each star is a family, each group of stars a community. Individuals are linked together in systems, systems combined into masses." All the Tunicaries are free in their young or larva state, but afterwards fixed to rocks, algæ, shells, and other marine bodies; some, however, as the Salpians and Pyrosomes, remain always free, floating in the water.

The Tunicaries have certain affinities with the *Bryozoa*, but their closest relationship seems to be with the other Acephalous Mollusca with calcareous shells. "Were the test of an Ascidian," says Professor E. Forbes, "converted into a hard shell, symmetrically divided into two plates, connected together dorsally by cartilage, and capable of separation, so as to expose the mantle along a ventral mesial line, whilst the orifices protruded at one extremity, it would present the closest similarity with many bivalve Mollusks." The gills in these animals have generally the form of ridges more or less complicated and seldom symmetrical, and their digestive, reproductive, and circulatory organs are tolerably complicated, and disposed at the base of their sac-like bodies.

Family BOTRYLLIDÆ.

Animals compound, fixed, adhering by their sides in a greater or less number, so as to resemble a single complex animal. Each individual with distinct branchial and anal orifices, and not connected by an internal union. Oviparous and gemmiparous.

Genus BOTRYLLUS, Lamarck. 1801.

Test irregular, gelatinous, formed of numerous systems arranged in simple stars. Individuals horizontal, with the vent far from the branchial orifice; branchial orifices simple, ranged round a common cloaca.

In this genus the tests of the animals are fixed together, forming a common mass in which the animals are imbedded in one or more groups or systems, but the individuals are not connected by any internal union. The species vary considerably in form and color, being purple, yellow, blue, gray, or green.

Botryllus Schlosseri.

Plate XXIII. Fig. 319.

Botryllus stellatus, Pallas, Lamarck, Brug., &c., teste Gould, Inv. 320. — Couthouy, Bost. Journ. ii. 111 (no descr.). — Stimpson, Check List, 1 (1860).

Alcyonium Schlosseri, Pallas, Elench. Zooph. No. 203.

Botryllus Schlosseri, Savigny, Mem. pt. 2, p. 200, pl. xx. fig. 5. — Forbes and Hanley, Brit. Moll. I. 19, pl. A. fig. 7, and pl. B. fig. 7.

It forms over the timbers and sea-weed a semi-transparent, gelatinous crust, studded at short intervals with minute stars. Each ray of these stars is a separate animal, with its head at the circumference and its tail descending into the jelly at the centre. (*Gould, Inv.* 320.)

As will be seen by the figure referred to, this species may be recognized by the compound body, which forms a greenish yellow mass in which are imbedded many purplish stars. Each individual measures one twentieth inch in diameter; the compound mass is several inches. It is also found in Great Britain.

Genus DIDEMNIUM, Savigny. 1827.

Test coriaceous, polymorphous, sessile, and incrusting; systems numerous, compressed, without central cavities or distinct circumscription. Individuals scattered; abdomen pedunculate. Ovary placed by the side of the intestinal loop, increasing in length when the eggs are fully developed.

The Tunicaries composing the systems of individuals in this genus are without any appreciable order of arrangement, and are scattered over the common body.

Didemnium roseum.

Didemnium roseum, Savigny, &c., Sars, Reise i Lofoten og Finmarken, p. 33, 1850.—Packard, Inv. of Labr. in Mem. Bost. Soc. N. H. i. 275 (1867).

Colony forming a calcareous, thin, incrusting mass, coriaceous, much expanded, surface finely granulated, being covered densely with round mammillated bodies. Branchial orifices rudely arranged in quincunces, slightly raised above the surface, formed of six triangular lobes, with the alternating lobes a little unequal in size, composed of three or four granules a little larger than those on the surface generally.

It bears a close resemblance to *Didemnium exaratum*, Grube (Ausflug nach Trieste, Taf. ii. Fig. 2, 2 *a*), but the branchial openings are thicker, and the mass thinner and more calcareous in our species. It agrees exactly with Sars's description of *D. roseum*, though it is whitish in alcoholic specimens.

Found frequently incrusting fucoids in masses an inch in diameter, in ten fathoms, Hopedale; and on the whole coast. I have also dredged it at Eastport in twenty fathoms. (*Packard.*)

I can add no further information in regard to this species than that contained in Dr. Packard's description copied above.

Family SALPIDÆ.

Animal free, pelagian, in the form of a more or less cylindrical tube open at one or both ends; test and mantle continuous with one another at the respiratory apertures, but elsewhere separated by a wide space; gill forming a hollow band crossing the respira-

tory cavity; anal orifice terminating close above, and to the right side of, the mouth. Alternately solitary and aggregated.

The Salpians occur under two distinct conditions, being at one time solitary, and at another associated into circular or lengthened groups. These *Salpa*-chains vary in length from a few inches to many feet, and swim through the water with a regular serpentine movement, but when taken from the water the individuals of the group are easily detached. Chamisso discovered that the solitary *Salpæ* do not belong to species distinct from those united in chains, however dissimilar, but are either the parents or the progeny, as the case may be, of the aggregate forms; and that chained *Salpæ* do not produce chained *Salpæ*, but solitary *Salpæ*, which in their turn do not produce solitary but chained *Salpæ*, hence giving rise to the paradoxical statement made in the general observations on the Tunicaries.

Genus SALPA, Forskäl. 1775.

Animal oblong, sub-cylindrical, truncated in front by the oral orifice, pointed posteriorly; anal orifice sub-terminal; test thin, gelatinous, transparent; muscular mantle in the form of transverse or oblique bands; mantle cavity lined by a system of vascular sinuses; gill rudimentary, forming an oblique band across the interior; visceral nucleus posterior. Sexes combined. Young produced by gemmation in chains, consisting of individuals unlike the parent and becoming oviparous, the alternate generations only being alike.

Krohn makes three types, to which all the variations of the associated *Salpæ* are reducible. The first is characterized by the vertical position of the animals forming the chain, the axes of their bodies crossing the axis of the chain at a right angle. In the second the bodies of the individuals are more or less inclined to the axis of the chain. The third group is distinguished by the horizontal position of the component animals, the axes of their bodies being more or less parallel to the axis of the chain.

Salpa Caboti.*

Salpa Caboti, Desor, Proc. Bost. Soc. Nat. Hist. iii. 75 (Oct. 1848), no descr. — Alex. Agassiz, from the same, xi. 17, Fig. 1–5 (Dec. 1866). — Stimpson, Check Lists, 1.

The *Salpa* here described is quite common south of Cape Cod in Vineyard Sound, Buzzard's Bay, and Long Island Sound. I suppose it to be the species named by Desor, *Salpa Caboti*, mentioned in the third volume of the Proceedings of the Boston Society of Natural History. As he has given no description, either of the chain or solitary form, it may not be out of place to describe our species, and point out its relation to other known species. The chains and solitary individuals make their appearance during the end of July, and have been found from that time till the end of October. The chains move along with the current, seemingly quite helpless, though the upper extremity is sometimes deflected somewhat abruptly by attempts to escape capture. The solitary individuals, on the contrary, are exceedingly active, swimming about vigorously, generally with the anterior extremity uppermost, expelling (through the posterior extremity) by quick and powerful jerks the water which propels them by its reaction. Their motions are very similar to those of *Trachynema* (*Circe*); they can readily change the direction of their movements, and regulate them by their powerful transverse muscular bands, though they lack in their motions the ease and grace of Jelly-Fishes.

In describing this *Salpa*, the side on which the heart is placed is called the dorsal; the opposite, on which the nervous ganglion is found, the ventral; while the anterior and posterior extremity correspond to the opening through which the water is introduced into the body, and expelled from it, thus homologizing the *Salpæ* completely with the fixed Ascidians to which they are so closely related. The proles solitaria of the *Salpa Caboti*, Des. (Figs. 1–3), resembles that of the *Salpa spinosa*, Ott., figured by Sars in his Fauna Litoralis, but differs from it materially, as the subsequent observations will show. The body is transparent, almost colorless, perfectly smooth, with the slightest possible tinge of pink, increasing in intensity towards the posterior extremity; the nucleus is of a deep chestnut color. The general outline of the body when seen from the

* Mr. Alexander Agassiz has kindly furnished me with the woodcuts used by the Boston Society of Natural History. His description is here copied in full.

dorsal (Fig. 1), or from the ventral side (Fig. 2), is barrel-shaped, with a uniform curvature at both ends. The posterior extremity

Fig. 350.

(Fig. 1)

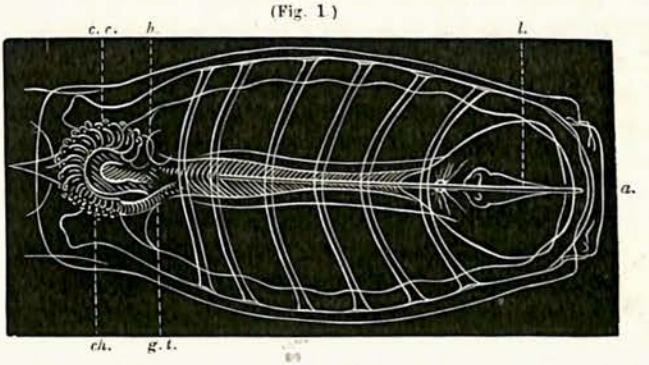


Fig. 351.

(Fig. 2.)

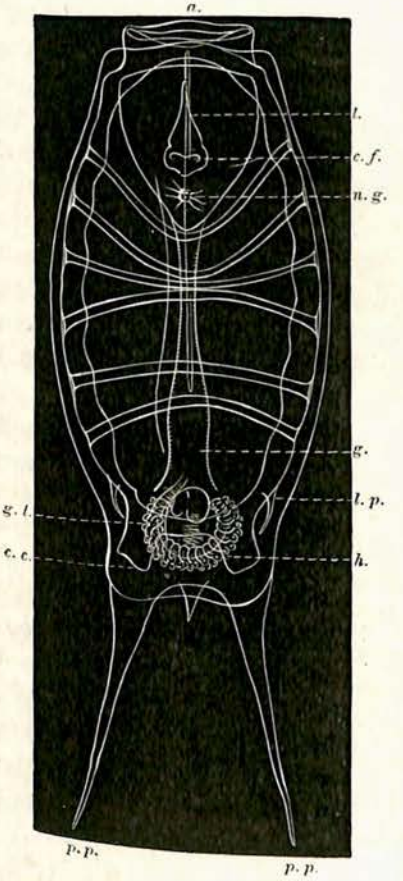
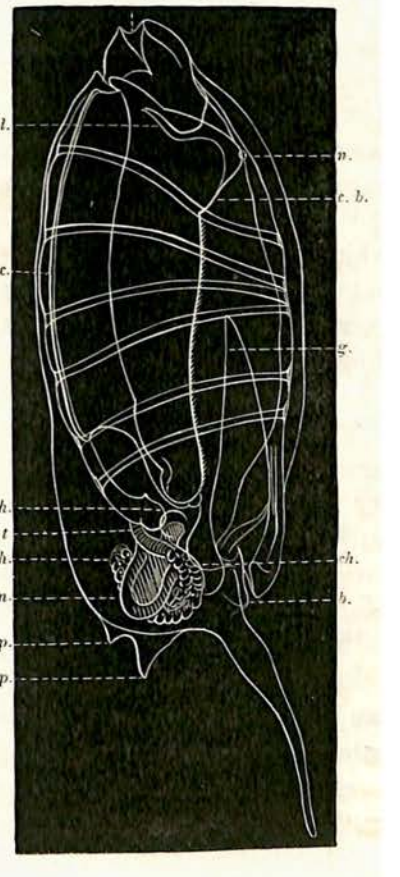


Fig. 352.

(Fig. 3.)



terminating in two long conical processes (*p. p.*) with a cœcum of the respiratory cavity (*c. c.*) at the base (Fig. 1). When seen in profile (Fig. 3), it is truncated abruptly at the two ends, from the ventral to the dorsal side; the extremities are slightly convex; the posterior truncating plane is more inclined than the anterior, and as the dorsal side is at the same time somewhat convex, this gives the anterior end a slightly pointed appearance. Besides the two large posterior conical processes, there are two sharp lateral ones, quite small (*l. p.*), and seen only from the ventral side (Fig. 2) on each side of the termination of the respiratory cavity, and two other short processes (*o. p.*) situated on the median line (Fig. 2) at the posterior extremity of the body, placed one above the other (Figs. 1 and 3). The larger process is situated nearest the posterior opening. These processes, like the surface of the body, are quite smooth. There are six muscular bands entirely encircling the body; the second, third, and fourth (beginning at the anterior extremity) unite on the ventral side, while on the dorsal side the muscular bands are nearly equidistant (see Fig. 1). The anterior opening for the admission of water is by far the largest of the two openings of the respiratory cavity; it occupies the whole width of the body (Figs. 1, 2), while the posterior one, through which the water is expelled, is much narrower and placed at a short distance from the posterior extremity, at the base of the truncating plane, on the ventral side, the anterior opening (*a.*) being nearer the dorsal side. The lips which close these openings are quite prominent, and can be thrown out considerably beyond the general outline, either when drawing in water or forcing it out; the lips of the anterior aperture open dorsally, those of the other end open in the opposite direction (*b.*) when in action (Fig. 3).

The external and internal tunics are well defined; hollowed out from this internal tunic arise the circulating veins; the larger ones are especially apparent at the point where the muscular bands are imbedded in this tunic. The gill (*g.*) runs nearly parallel with the ventral surface in the shape of a thick, hollow column, wider at the posterior extremity; it communicates dorsally and ventrally with the circulating system, and is strongly ribbed on the back and sides with bands of cilia. At the anterior edge of this gill is placed the languet (*l.*), a long, grooved, conical process slightly *s*-shaped, extending to the dorsal side of the respiratory cavity and hanging freely within it, attached by a broad base to the ventral side of the cavity; the base of attachment is formed by a widening of the foot

of the languet, where we find the ciliated fossa (*c. f.*). The large triangular area (Figs. 1 and 2) within which the languet is placed extends from the anterior end of the gill, and the vibratile cord (*c. b.*) which defines this vibratile cavity, as the area is called, encircles completely the anterior extremity of the respiratory system, and occupies about one quarter of the length of the body. At the angle made by the vibratile band, forming the edge of this cavity, where the cord takes a dorsal direction, is placed the nervous ganglion (*n. g.*), immediately behind the base of the languet; the ganglion is quite prominent, and sends numerous branches to the walls of the body. A large vesicle attached to the ganglion contains three irregularly shaped calcareous bodies, with deep black pigment spots on the exterior side, making the nucleus a most prominent object at the bottom of the ciliated cavity. The endostyle (*e.*) occupies nearly two thirds of the length of the body. The heart (*h.*) is very prominent; it is placed slightly to one side of the median line, above the nucleus.

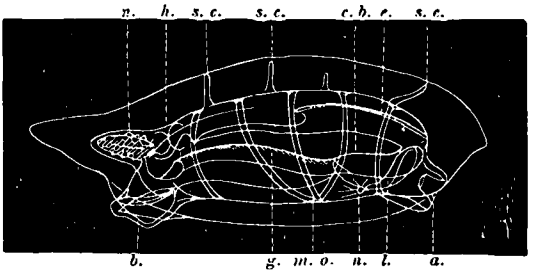
Surrounding the nucleus (*n.*) is found a chain of diminutive *Salpæ* (*ch.*), extending in a circle from the right side of the nucleus on the upper side to the opposite side, then running under it and coming out on the opposite side again, and stretching toward the median line. The young *Salpæ* are all attached by the posterior extremity, exactly as we find colonies of fixed Ascidians and Bryozoans, to a tube (*g. t.*), which is a simple diverticulum of the circulatory system, and freely communicating with the gemmiferous tube, as it is called. The young *Salpæ* are not uniformly developed in proportion to their distance from the base of the tube. Sections of the tube are equally advanced, and we find generally three such portions unequally developed, as has been noticed by Sars, Krohn, Huxley, and others. The base of the gemmiferous tube is simply slightly corrugated, next comes a section in which we find two rows of slight elevations, and finally the most advanced part of the chain where the rudimentary *Salpæ* are more or less advanced, and resemble in every respect, long before it becomes detached, the chains which are found floating about. These sections are thus liberated in turn, new ones continually forming at the base of the gemmiferous tubes during the budding season. The part of the chain which is the most advanced occupies, however, so much of the tube, that the other sections are scarcely noticed. These chains escape through an opening formed at the proper time through the tunic, near the nucleus, on the ventral side, which shows afterwards no

trace of the passage of the small chain. When the solitary *Salpæ* are kept in confinement for any length of time, nothing is more common than to find floating about diminutive *Salpæ*-chains, nearly identical in every respect, except size, with the larger chains found at the same time in the sea. These small chains usually consist of from twenty to twenty-eight pairs; they increase rapidly in size, as we find them of all sizes during every month in which *Salpæ* have been noticed, from the chains just escaped to the largest, which have already lost their solitary embryo. The mouth is placed beneath the heart, at the upper extremity of the posterior part of the gill: it opens into a kind of œsophagus, and in the winding course of the digestive cavity can readily be followed in specimens which have lost the chain of *Salpæ;* the anus opens close behind the mouth in the respiratory cavity. The pyriform tubes first noticed by Huxley are readily seen in the solitary specimens, though they are more plainly observed, as well as the elœoblast, in the aggregate form, just after their escape from the solitary *Salpæ.*

The principal difference between the solitary and aggregate forms is one of outline, and in the proportion of the different organs, which

Fig. 353.

(Fig. 4.)



are essentially the same, except the organs of reproduction. The individuals of the chains are all alike on one side; that is, we find the endostyle either slightly to the right or to the left of the median line, according as the individuals are on the right or left row of the chain. When seen from above or below, the aggregate form has not the regular barrel-shape so characteristic of the solitary *Salpa;* it is more spindle-shaped, with two somewhat ill-defined conical projections at the posterior extremity, into one of which the nucleus projects, and into the other a spur of the posterior cavity coming close to the surface, one of the eight spurs by which the respiratory cavities of adjoining individuals are connected. Each individual is

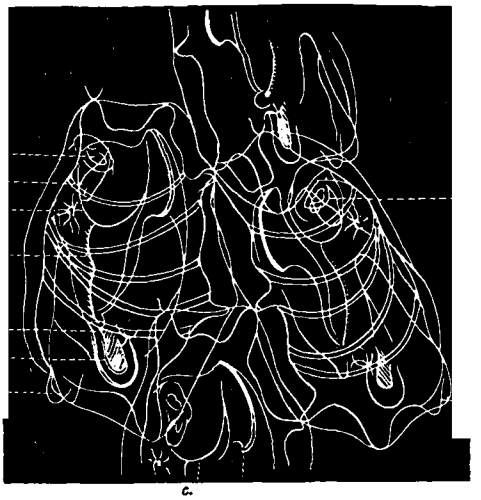
in direct communication with no less than three adjoining ones, as will be seen hereafter. When seen in profile (Fig. 4), the outline is ellipsoidal; the two principal openings are placed at a distance from the extremities, the anterior spur of the tunic extending beyond the opening, thus bringing both their openings rather more to the ventral side, and not strictly along the continuation of the axis, but on each side of it. There are only five muscular bands, one at the posterior extremity, three others uniting on the ventral surface, somewhat behind the anterior part of the gill, and another ill-defined one at the anterior extremity. The nucleus (*n.*) is much larger in proportion to the body than in the solitary form; the endostyle (*e.*) occupies but a little more than a third of the cavity. The gill, when seen in profile, runs somewhat obliquely towards the anterior extremity, where it is nearest the ventral surface. There is no perceptible difference in the size of the anterior and posterior openings of the respiratory cavity. The vibratile cavity and the nervous ganglion do not differ in structure from those of the solitary form; the languet is perhaps somewhat broader and more powerful. In the chains I have had the opportunity to examine, I found either that the solitary fœtus had already been expelled, or was only slightly developed, so that I can only say that its position corresponds with what has been described by Sars, Krohn, Vogt, and others, the tests, as is well known, being greatly developed in the individuals which had already lost their solitary fœtus. What is worthy of special notice in the aggregate form is the great thickness of the tunic; this would make the connection between the individuals of a chain simply a mechanical one, were it not for the spurs from the respiratory cavity (*s. c.*), which project through the thickness and connect with similar spurs in adjoining individuals. The spurs disappear invariably after the individuals of a chain have become separated for any length of time, and they are incapable of reuniting again, as has erroneously been asserted. When thus freed, the aggregate form is perfectly helpless, the great thickness of the tunic preventing it from regulating its motion; while, when connected as a chain, their capacity to guide the chain in any particular direction is much greater.

Sars has described exceedingly well the mode of aggregation of the chain of *Salpa runcinnata;* the chains, however, were quite far advanced, and he found it impossible to trace distinctly their mode of junction. Soon after the chain escapes from the solitary form, while still quite small, so that four or five individuals can

be brought under the focus at once, their peculiar arrangement is readily understood. The chain (Fig. 5) consists of two rows of

Fig. 354.

(Fig. 5.)



individuals placed slightly obliquely to the axis of the chain, in addition to the natural obliquity of the individuals on the right and left sides. The ventral side is always turned outside, and the individuals are placed back to back at an angle measured by the obliquity of the endostyles, which is quite considerable. Besides this oblique arrangement of the ventral and dorsal sides, the anterior and posterior extremities are not on the same level; the anterior extremity is tilted up so that all the anterior openings are brought to the upper side of the chain when it is floating, and the posterior openings close to the edge on the lower side; the anterior opening is placed at a short distance from the edge of the chain, thus bringing, by this arrangement, the anterior and posterior openings on different sides of the chain. Adjoining individuals are connected by the two large dorsal spurs of the anterior extremity of the respiratory cavity. The next pair of individuals lap over the first pair of the chain very considerably, so far that the nucleus of the first pair is just below the nervous ganglion of the second pair. The right individual of the anterior pair is connected with the individual immediately behind it by the small spur behind the nucleus, while it (the right-hand individual of the second pair) connects with its adjoining fellow in the same way as

in the anterior pair, and with the left anterior one by means of the two small dorsal spurs of the latter, and so on, for each succeeding pair, so that every individual of the chain is always connected by spurs to the three immediately surrounding it in front, on the side, and behind.

As far as I have noticed, the chains remain connected till they are fully grown, although the breaking up of the chain from any cause does not prevent the components from living for a short time, yet the chain, as a whole, is by far more active than the separate components when free. The largest chains I have seen are somewhat over a foot in length; in these the individuals measured about five eighths of an inch in length. This is much smaller than the solitary forms, which attain a length of an inch. Sars and Krohn were the first to repeat the observations of Chamisso concerning the connection of the solitary and aggregate forms, and they have clearly shown that the solitary form is asexual, always producing by budding a chain of *Salpæ* which are the sexual forms, and bring forth but a single embryo developed from an egg, giving rise to the solitary form. Huxley, Leuckart, and Vogt have also since shown the entire accuracy of the observations of Chamisso, and have greatly increased our knowledge of the organization and development of these animals. The observations I have made concerning the early development of the chain and the solitary embryo are too fragmentary for publication, and I am induced to give this description of our *Salpa*, in hopes of calling attention to its existence on our coasts, and inducing those who are more favorably situated than I am to develop further this interesting subject. I would also add that this *Salpa* is not the only free Tunicate frequenting our coasts; two species of *Appendicularia* are extremely common, which have thus far escaped the attention of zoölogists; they are closely allied to *A. furcata* and *A. longicauda;* they both occur in Massachusetts Bay and Long Island Sound, while the *Salpa Caboti* has not as yet been found farther north than Nantucket.

EXPLANATION OF FIGURES AND LETTERING.*

a. Anterior opening.
b. Posterior opening.
e. Endostyle.
n. g. Nervous ganglion.
c. f. Ciliated fossa.
c. b. Ciliated band.
ch. Small Salpa chain within form.
g. Gill.

* These Figures of *Salpa* have a double numbering, one referring to the figures in this work, the other being the same as in the Boston Proceedings.

l. Languet.
h. Heart.
n. Nucleus.
g. t. Gemmiferous tube.
m. b. Muscular bands.
c. c. Cœcum of respiratory cavity.
s. c. Connecting spurs of respiratory cavity.
m. Mouth.
o. p. Odd terminal processes on median line.
l. p. Lateral processes of ventral side.
p. p. Pair of terminal processes of posterior extremity.

(Fig. 1.) Solitary form, from the dorsal side.
(Fig. 2.) Solitary form, seen from the ventral side.
(Fig. 3.) Solitary form, seen in profile.
(Fig. 4.) Three-quarter view of the aggregate form.
(Fig. 5.) Part of chain of *Salpa Caboti*, to show the arrangement and connection of the components.

Family ASCIDIIDÆ.

Body sacciform, gelatinous or coriaceous, fixed at one extremity, free at the other, with two more or less prominent orifices, a branchial and an anal; branchial sac simple or plicate. Not united into groups by a common integument; solitary or gregarious. Oviparous. Sexes united.

In the genera *Ascidia* and *Molgula* the gills are not plicated, which is the case in the other genera. *Cynthia* and *Chelyosoma* are sessile, while *Boltenia* and *Cystingia* are pedunculated.

Genus **BOLTENIA**, Savigny. 1828.

Body more or less globular, fixed, pedunculated; test coriaceous; orifices lateral, each cleft into four rays; branchial sac longitudinally plicated, surmounted by a circle of compound tentacula.

Boltenia clavata.

Plate XXIII. Fig. 325.

Ascidia clavata, Fabricius, Fauna Grœnl. 333 (1780).
Ascidia globifera, Sabine, App. to Parry's Voy. No. 10 (1824).
Boltenia reniformis, MacLeay, Lin. Tr. xiv. 536, pl. xviii. (1825). — Dujardin in Lamarck, An. sans Vert. iii. 539 (1840). — Gould, Invert. 319. — ? De Kay, N. Y. Moll. 260, pl. xxxiv., fig. 234 (1843). — Stimpson, Grand Manan, 20 (1854).
Boltenia clavata, Stimpson, Smithsonian Check List, 1 (1860), no descr.
? *Boltenia Bolteni*, Packard, Invert. of Labr. in Mem. Bost. Soc. N. H. i. 277, no descr.; not *fusiformis*, Savigny.
? *Boltenia oviformis*, Packard, Can. Nat. (1863).

This is a most curious object, and greatly resembles in shape the flower of Ladies'-slipper (*Cypripedium*) on its stalk. It has

a kidney-shaped body, of a wrinkled, leathery structure, about two inches long and one in width, suddenly narrowing at the top into a small stalk not larger than a crow-quill, and from six to twelve inches in length. It has two cross-shaped orifices, nearly an inch apart. It is attached by its stalk to stones in deep water, whence it is occasionally hooked up by the fishermen, or driven on shore by storms. Its surface is usually loaded with marine plants, zoophytes, &c. (*Gould.*)

The figure referred to is drawn from a specimen preserved in alcohol, collected by Dr. Packard.

Dr. Stimpson remarks on the species: "This species is very distinct from the preceding (*B. rubra*), being uniformly of a fine yellowish white color, with a smooth, velvety surface. It inhabits rocks in deep water, never occurring in less than fourteen fathoms. I am far from certain that it can be referred to *B. reniformis*, but approaches that species more than any of the others mentioned by MacLeay in his memoir."

Boltenia rubra.

PLATE XXIV. FIG. 337.

Boltenia rubra, STIMPSON, Proc. Bost. Soc. Nat. Hist. iv. 232 (1852); Grand Manan, 20 (1854); Check Lists, 1.

Body arcuated, slightly compressed laterally, and tapering rather abruptly to the stem, which is slender, very hard, and granulated. Test very rugose, especially on the dorsal surface, and of a deep red color. Anal aperture nearly sessile; branchial on a short tube which curves toward the stem. Total length, one foot; length of the body, one and three fourths inches; breadth, seven eighths of an inch.

This species lives attached to rocks in from two to fourteen fathoms. I have found it in Massachusetts Bay, from Boston to Cape Ann; and also at Grand Manan, at the mouth of the Bay of Fundy. (*Stimpson.*)

The above description is copied from Dr. Stimpson. To the species I doubtfully refer the figure drawn from nature by Mr. Burkhardt, which I received without name from Professor Agassiz. It will be observed that the figure hardly agrees with several points of Dr. Stimpson's description. The body is larger in proportion to the length of the stalk; the extremity of the latter is also bifid. It may be that *Boltenia reniformis* of De Kay belongs to this species rather than to *B. clavata.*

Boltenia microcosmus.

PLATE XXIV. FIG. 338.

Boltenia microcosmus, AGASSIZ, Pr. Am. Ass. Adv. Sc. ii. 159 (1850).
Boltenia microsoma, H. and A. AD., Gen. Rec. Moll. i. 594.

Sac larger and rounder than in the species to which it has been formerly referred. Chelsea Beach and Point Shirley, also George's Banks. (*Agassiz.*)

The figure given on Plate XXIV. was drawn by Mr. Burkhardt from the original specimen. It serves, therefore, to fix the species and give us the following characteristics. The sac is of a deep rusty red color; it is almost equally rounded at its two extremities, so as very abruptly to join the stem; the openings are like two prominent warts, nearly sessile, equally inclined in a contrary direction; the stem is uniformly stout, of a dirty iron color, eight inches long; sac, one and six tenths inches long, eight tenths of an inch wide.

Boltenia Burkhardti.

PLATE XXIV. FIG. 327.

Boltenia Burkhardti, AGASSIZ, in manuscript.

Body angularly ovate, truncated anteriorly, posteriorly rapidly and angularly attenuated to its stalk; uniformly covered with short, stout cilia; of a bright pinkish color, shading into yellowish on its posterior half; orifices of a darker pink, or reddish, connected by a long, horizontal, rectilinear elevation, from the ends of which they open laterally; stalk stout, three times the length of the body, uniformly hirsute, yellowish. Body, one and two tenths inches; stalk, three and five tenths inches.

The above description is drawn from a figure by Mr. Burkhardt of a living *Boltenia* in the Aquarial Garden at Boston, 1859. The species differs from any other yet noticed on our coast by the peculiar angular shape of the body, the position of the orifices on an elongated, horizontal ridge, and by its hirsute surface. *Boltenia ciliata* of Möller* is a much smaller species.

* *B. ciliata.* Corpore subreniformi, fusco-luteo, tuberculato, ciliato; orificiis prominulis, rubicundis; pedunculo granulato, ciliato, terminali; L. totius animalis 18‴ R. (Ind. Moll. Gr. 22.)

Genus PERA, Stimpson. 1852.

Body pyriform, adhering by a very small base; test gelatinous; orifices sessile, the branchial six-lobed, the anal four-lobed; branchial sac plicated.

Pera pellucida.

Pera pellucida, Stimpson, Proc. Bost. Soc. iv. 232 (1852); Check Lists, 1.

Body pear-shaped, the tunic at base often continued into a short stem. Test rather thin, hyaline, covered with small conical eminences or papillæ, especially about the orifices, which are very small, distant from each other, and difficult to distinguish. Branchial sac with ten folds. Length, one inch.

Found adhering to bunches of *Sertularia polyzonias*, taken on St. George's Bank in thirty fathoms. (*Stimpson.*)

Genus CYNTHIA, Savigny. 1827.

Body sessile, covered with a coriaceous tunic; oral and anal orifices four-lobed; branchial sac longitudinally plicated, surmounted by a circle of tentacular filaments; meshes of respiratory tissue not furnished with papillæ. Ovaries usually two.

The species range from low water to thirty fathoms. They are frequently found associated in groups of numerous individuals, and their tests, even in the same species, are often variously colored.

Cynthia pyriformis.

Plate XXIII. Figs. 320, 321.

Cynthia pyriformis, Rathke. — Stimpson, Inv. of Gr. Man. 20 (1854); Check Lists, 1. — Packard, Invert. of Labrador in Mem. Bost. Soc. i. 277 (1867), no descr.

This species I have identified by European examples sent me by M. Sars. They are perfectly the same. It is one of the most beautiful marine productions found in this region, having, in its hard, velvety surface, and bright pink blush, precisely the aspect of a blood-peach. In fact, it is called *sea-peach* by the inhabitants. Some of my specimens are three inches in length. It lives in clear

water on rocky bottoms among nullipores, sometimes at low-water mark, but usually in four or five fathoms. (*Stimpson.*)

Grand Manan (*Stimpson*); Straits of Belle Isle (*Packard*).

The figures which I have given of this species are drawn by Mr. Morse, from specimens dredged by Dr. Packard. They show the species to vary from a circular to an oblong form, and sometimes to be attached by a short, broad peduncle rather than by its base. The orifices form prominent protuberances on the upper surface.

Cynthia partita.

Cynthia partita, STIMPSON, Proc. Bost. Soc. N. H. iv. 231 (1852); Check Lists, 1.

Body oblong, or subglobular, attached by the base. Test hard, strong, coriaceous, rugose, wrinkled in various directions, and of a dark purplish brown color. Apertures square, on prominent eminences, opening widely, the branchial being largest. The tubes are very beautifully marked exteriorly by alternating triangular areas of white and purple, arranged as in the shell of a *Balanus;* the white ones having their bases, and the purple ones their apices, on the margin of the aperture. In one instance parallel stripes took the place of triangles. Diameter, one inch.

It is occasionally dredged in Boston Harbor, west of Governor's Island, in four fathoms, among stones and shells. (*Stimpson.*)

Cynthia echinata.

PLATE XXIII. FIG. 326.

Ascidia echinata, LINNÆUS; O. FABRICIUS, Fauna Grœnl. 331. — FORBES and HANLEY, Br. Moll. pl. C, f. 4.

Cynthia echinata, STIMPSON, Grand Manan, 20, no descr. (1854); Check Lists, 2. — PACKARD, Invert. of Labrador in Mem. Bost. Soc. i. 277 (1867), no. descr.

Body circular, adhering by its base, yellowish, or brownish in parts; surface crowded with short, upright, sharp protuberances, from near the top of which radiate about six sharp short bristles. Diameter, one inch.

The figure is drawn from a specimen preserved in alcohol, collected by Dr. Packard. In shape, and in the bristles of the surface, it bears some resemblance to *Ascidia echinata*, Lin., as figured by Forbes and Hanley, Plate C, Fig. 4, but the star-like bristles on that species are much less crowded and numerous.

Grand Manan (*Stimpson*); Chateau Bay (*Packard*).

Cynthia gutta.

Cynthia gutta, LUTKEN, see STIMPSON, Proc. Bost. Soc. N. H. iv. 231 (1852).

Body flat and disk-like, oval, adhering by a very broad base. Test strong, thin, smooth, opaque, deep red, expanded upon the surface of attachment so as to form a margin. Orifices small, square, slightly prominent. Diameter, half an inch.

This species is very common in Boston Harbor, adhering to dead valves of *Mytilus modiolus*, on the shelly bottom between Bird Island and South Boston Flats, where the depth is from three to five fathoms. It resembles very much a drop of blood. (*Stimpson.*)

Cynthia placenta.

PLATE XXIII. FIG. 322.

Cynthia placenta, PACKARD, Mem. of Bost. Soc. Nat. Hist. i. part 2, p. 277 (1867).

Test broad, expanded, much flattened, very emarginate, about five times as broad as high, with the thin edge uneven, revolute; surface granulated, though the scales are flattened. Anal and branchial orifices much alike, of equal height, and as distant from each other as the thickness of the test, which is half an inch in diameter.

One specimen covered with sand was larger and more roughened about the orifices than the other specimen, which was smooth and naked.

Dredged in the straits of Belle Isle, forty fathoms, hard bottom; Henley Harbor, ten to twenty fathoms, sandy; Chateau Harbor, Long Island, fifteen fathoms, sandy. It is also common in the Bay of Fundy. (*Packard.*)

The figure given of this species was drawn by Mr. Morse from the original specimen preserved in alcohol.

Cynthia condylomata.

PLATE XXIII. FIG. 324.

Cynthia condylomata, PACKARD, Invert. of Labrador, &c. in Mem. of Bost. Soc. Nat. Hist. i. part 2, p. 277 (1867).

Test spherico-conical, surmounted by a spinulated apex; it is a little higher than broad, with transverse rows of lighter-colored, unequal, wart-like tubercles, which often terminate in minute, blunt

spinules, the larger ones stout and curved, with black tips. Apex of the test high, rising up between the two orifices into a square, truncate, corneous projection, and terminating in five or six large spines. Incurrent and excurrent orifices, consisting of four triangular depressed valves, being surrounded by a raised broad rim of crowded tubercles, surmounted by spinules. Length, half an inch. A still larger specimen, over an inch in length, from the Banks of Newfoundland, is in the Museum of the Essex Institute.

This species may be easily recognized by its conical form, with circles of large wart-like tubercles, and the steeple-like corneous apex, truncated at tip, and armed with acute, short, thick spinules.

Caribou Island, eight fathoms, on nullipores. (*Packard.*)

The specimens figured were preserved in alcohol by Dr. Packard. The species must be nearly related to *Ascidia monoceros.**

Cynthia rugosa.

Ascidia rugosa, AGASSIZ, Proc. Am. Ass. Adv. Sc. ii. 159 (1850).

Surface wavy, brown; aperture square, of purple color. (*Agassiz.*)

I have seen no specimen or drawing of this species, and can add nothing to the description copied above. The "square aperture" suggests that the species belongs to the genus *Cynthia* rather than *Ascidia*. In the latter genus neither of the apertures is square.

Cynthia hirsuta.

PLATE XXIV. FIG. 336.

Ascidia hirsuta, AGASSIZ, Proc. Am. Ass. Adv. Sc. ii. 159 (1850).

Still smaller (than *Ascidia carnea*), of a rose color dotted with white; of an intense red around the square apertures; the body is covered with fringes. Off Cape Cod. (*Agassiz.*)

The figure referred to is copied from Mr. Burkhardt's beautiful drawing of the original specimen. It serves accurately to fix the species, which is of a correct egg shape. Its four-lobed orifices place it in the genus *Cynthia*.

Professor Agassiz gives no measurements. I believe the drawing to be twice the natural size of the animal.

* *A. monoceros.* Corpore cylindrico; tunica tuberculata, pallide rubra, prominentia, cornea, conica, terminali, inter orificia eminente instructa; orificiis prominentibus, rubris. L. 15‴ Rs. (Ind. Moll. Gr. 22.)

Genus MOLGULA, Forbes.

Body more or less globular, attached or free; test membranous, usually invested with extraneous matter; orifices on very contractile, naked tubes, the oral six-lobed, the anal four-lobed.

The species of *Molgula* have been found between tide-marks in the laminarian zone, and as deep as twenty-five fathoms. The surface is usually covered with particles of sand and other substances. Except in the number of lobes in the oral aperture, *Glandula* of Stimpson does not seem to differ from this genus.

Molgula arenata.

Molgula arenata, Stimpson, Proc. Bost. Soc. N. H. iv. 230 (1852); Check Lists, 2 (1860).

Body somewhat compressed laterally. Test thin, uniformly covered with coarse sand, which adheres very strongly. Apertures small, on very short tubes, far removed from each other. Length, three fourths of an inch.

It inhabits the region of Nantucket and Martha's Vineyard. (*Stimpson.*)

Molgula producta.

Plate XXII. Figs. 315, 316.

Molgula producta, Stimpson, Proc. Bost. Soc. N. H. iv. 229 (1852); Check Lists, 2.

This species is usually perfectly globular, while the apertures are on tubes often equal in length to the diameter of the body, which originate close together and diverge. The test is rather thin, pellucid, usually of a pale rose tint, and covered, the tubes included, with a thin coating of sand. The branchial aperture is rounded, with six short cirrhi within; the anal is square. Diameter, half an inch.

It occurred on a sandy bottom, in six fathoms, in Boston Bay, and also at low water on Bird Island. The tadpole-like young were ejected in August, and were of a light vermilion color, which continued for a long time after their final detachment. (*Stimpson.*)

The drawing by Mr. Burkhardt, which I have referred to this species, differs in color from Dr. Stimpson's description. The details given by Mr. Burkhardt's drawings show the apertures to correspond with the generic description of Molgula.

Genus GLANDULA, Stimpson. 1852.

Body globular, always free, and thickly coated with sand, mud, or other extraneous substances. Apertures on tubes, the branchial with four lobes, the anal square. Branchial sac with few distant plications.

Glandula mollis.

Plate XXII. Fig. 317. Plate XXIV. Figs. 328, 329.

Glandula mollis, Stimpson, Proc. Bost. Soc. iv. 230 (1852); Check Lists, 2. (1860).

Body globular, but often considerably flattened, soft, and flexible. Test very thin, transparent, and thickly covered with loose sand. Diameter half an inch, usually less.

Dredged abundantly on a sandy bottom in ten fathoms, off Cheney's Head, Grand Manan. (*Stimpson.*)

The drawings by Mr. Burkhardt, copied on the plate, were received without name. If they represent this species, they show it to vary considerably in form.

Glandula fibrosa.

Plate XXIII. Fig. 323.

Glandula fibrosa, Stimpson, Proc. Bost. Soc. N. H. iv. 230 (1852); Check Lists, 2 (1860).

Glandula glutinans, Packard, Invert. of Labr. in Mem. Bost. Soc. N. H. i. 277, no descr. (1867).

Cynthia glutinans, Möller, Ind. Moll. Gr. 21 (1842).

Test thin, but very tough and leathery, covered with numerous fibres resembling cotton, which serve as a framework or attachment for the hard, thick coating of mud, in which this species is always found incased. Thus a ball is formed of about one inch in diameter, twice that of the body alone. The tubes extend only to the surface of the ball. It is an exceedingly tough, hard species, and when divested of its covering will bear the weight of several pounds without bursting.

Dredged in thirty-five fathoms on a muddy bottom, in the Hake Bay, off Grand Manan. (*Stimpson.*)

The figure referred to above is drawn from a specimen preserved in alcohol, received by Dr. Packard from Lutken, under the name

of *Cynthia glutinans*.* It is similar to specimens dredged by Dr. Packard at "Henley Harbor, 6 f. sand." It seems to answer Dr. Stimpson's description. Should the two species prove identical, Möller's name has priority.

Genus ASCIDIA, Lin. 1758.

Body sessile, covered with a coriaceous or gelatinous tunic; branchial orifice eight-lobed, furnished inside with a circle of tentacular filaments, anal orifice six-lobed; branchial sac not plicated, the meshes papillated.

The *Ascidiæ* are frequently found attached to the under surface of rough stones on the shore at low water in various parts of the world. They are variously and often splendidly colored, but otherwise unattractive or even repulsive in aspect. Numbers of them are often found clustering among tangles, like bunches of some strange semi-transparent fruit.

Ascidia amphora.

Plate XXIV. Fig. 333.

Ascidia amphora, Agassiz, Proc. Am. Ass. Adv. Sc. ii. 159 (1850).
Ascidia rustica, Gould, Invert. 319.—De Kay, N. Y. Moll. 259; not of Linnæus.

The most common of all, confounded hitherto with the *Ascidia rustica* of Europe. (*Agassiz.*)

The figure referred to is copied from Mr. Burkhardt's drawing of the original specimens. The following description is from the first edition of the Invertebrata:—

It is found of all sizes, from that of a pea to that of an olive, adhering in clusters to floating timbers, to stones, corals, &c. It may always be found in abundance on the under side of logs in the timber-docks about Boston. It is usually of a globular form, but more or less irregular in shape and in the degree of smoothness of its surface, and in substance is much like crude india-rubber. It is usually invested with plants or particles of earth, but, when clean, it is rust-colored. It has two small orifices near each other, through which a jet of water is projected, whenever a touch induces the animal to contract. I am not aware that it is in any way injurious to man.

* *Cynthia glutinans.* Tunica flavescente, tenui, subpellucida, glutinosa, arena abducta; orificiis prominentibus, contiguis. Diam. 3.5‴. (Möll. Ind. Moll. Gr. 21, 1842.)

Ascidia psammophora.

PLATE XXIV. FIGS. 330, 331.

Ascidia psammophora, AGASSIZ, Proc. Am. Ass. Adv. Sc. ii. 159 (1850).

Whose body is surrounded all over with fine sand. Found around Cape Cod. (*Agassiz.*)

The figure copied from Mr. Burkhardt's drawing of the original specimens will fix this peculiar species. It is readily distinguished by its triangular shape. The orifices are widely separated, — the branchial at the upper extremity on a long, stout tube; the anal at the lower right-hand corner of the triangle, much more sessile than the branchial. When the sand is washed off the body, the viscera show through, and the animal is of a rust color.

Ascidia ocellata.

PLATE XXIV. FIG. 332.

Ascidia ocellata, AGASSIZ, Proc. Am. Ass. Adv. Sc. ii. 159 (1850).

A beautiful tubular species, almost transparent, having a circle of red dots (eyes) around the openings. From New Bedford. (*Agassiz.*)

Mr. Burkhardt's beautiful drawing of the original specimen serves to fix this species beyond a doubt. It is probably identical with the more recently described *A. tenella.*

Ascidia tenella.

Ascidia tenella, STIMPSON, Proc. Bost. Soc. N. H. iv. 228 (1852); Check Lists, 2 (1860).

Body oblong, somewhat elongated, flaccid, adhering by the base. Test or outer tunic soft, gelatinous, slightly wrinkled, transparent, showing beneath the folds of the branchial sac. Inner tunic pale yellowish. Orifices terminal, approximated, on short tubes, the branchial largest, with seven or eight lobes and the same number of red ocelli. The anal has six lobes and six red ocelli, which are much brighter colored than those of the branchial orifice. Length about one inch, breadth one third of an inch.

This species was dredged at the depth of thirty-five fathoms on a shelly bottom near Great Duck Island, Grand Manan. It adheres to fragments of shells and often to other Ascidians. It

resembles a species which I received from Europe under the name of *A. mentula*, but does not agree with the descriptions of that species. (*Stimpson.*)

Probably synonymous with the earlier described *A. ocellata.*

Ascidia carnea.

PLATE XXIV. FIGS. 334, 335.

Ascidia carnea, AGASSIZ, Proc. Am. Ass. Adv. Sc. ii. 159 (1850).

A small species, red-colored, with a smooth body. Lives in deep water, upon shells. Not immature. (*Agassiz.*)

The original specimen of this species, from Boston Harbor, was drawn by Mr. Burkhardt. His figure is copied on Plate XXIV. It will fix the species better than any description taken from a drawing alone, which would be unsatisfactory, if not inaccurate.

Ascidia Manhattensis.

Ascidia Manhattensis, DE KAY, N. Y. Moll. 259 (1843). — STIMPSON, Check Lists, 2 (1860).

Oblong-oval, globular; orifices distant, elevated, and surrounded by ten to thirteen verrucose processes; externally corrugated, often covered with marine sordes, concealing the natural color. When held against the light, the intestinal canal may be indistinctly traced. The shape varies according as they are crowded together or isolated; in the latter case they are oval-orbicular. Uniform ashen-gray or brown. Diameter, from three tenths to one inch.

In the young, the orifices are both terminal. The aperturæ incarnatæ attributed by Linnæus to the *rustica* are wanting in this species, and the references to Müller indicate a very different animal. The *ovalis* of Lesueur, another allied species, has the tubes plaited. Our species is commonly found, in the months of September and October, adhering to stones, dock-logs, and other submerged bodies. I refer to it a small *Ascidia*, about three tenths inch in diameter, adhering to salt grasses. (*De Kay.*)

The above description of De Kay does not even establish the generic position of the species. It is, however, admitted as an *Ascidia* in Dr. Stimpson's Smithsonian Check Lists.

Ascidia callosa.

PLATE XXIII. FIG. 318.

Ascidia callosa, STIMPSON, Proc. Bost. Soc. N. H. iv. 228 (1852); Check Lists, 2 (1860). —PACKARD, Invert. of Labrador, in Mem. Bost. Soc. i, 276 (1867).

Body depressed, usually oval or oblong, but varying in shape. Test, when free from the parasitic growth which usually covers it, of a light sepia or pale bluish color, translucent, although thick and fleshy. Its thickness varies in different parts of the body from the character of the surface, which is very rugose, rising into irregular prominences and ridges. Apertures dark purple or reddish, situated on prominent warts; the seven-rayed branchial, which is largest, being terminal, and the six-rayed anal removed from it by a distance less than one half the length of the body. The branchial tube within has seven strong longitudinal ridges. Branchial sac finely reticulated. The inner tunic, where it covers the abdomen, is marked with crowded golden specks. Length, often three inches; breadth, two inches. This species is abundant in Passamaquoddy Bay, from low-water mark to thirty feet. It is usually found adhering broadly by the left side to the under surface of large stones. (*Stimpson.*)

Grand Manan (*Stimpson*); Strs. of Belle Isle, Packard, one of whose specimens, preserved in alcohol, is drawn on Plate XXIII.

Genus CHELYOSOMA, BRODERIP and SOWERBY. 1830.

BODY depressed, oblong, fixed, sessile; test coriaceous, its upper surface consisting of eight somewhat horny, angular plates; orifices small, prominent, perforating the plaited surface, each surrounded by six triangular valves; gills plicated; tentacles simple.

Chelyosoma geometricum.

Ascidia geometrica, STIMPSON, Proc. Bost. Soc. N. H. iv. 229 (1852).
Chelyosoma geometrica, STIMPSON, Smith. Inst. Check Lists, 1 (1860).

Body adhering by a broad base, depressed, oval. Test thin, smooth, transparent, very pale greenish, with an almost peripheric, narrow, dark-colored line or ridge, like a fibre, from which other lines of the same character proceed, dividing the surface into ten irregular polygons, two of which, separated from each other by a

third, contain the apertures. The two polygons are wheel-like, being radiated with six spokes from a centre, which is the sessile aperture. Proceeding from and perpendicular to each of the dark lines are bright straw-colored fibres, extending toward the centres of the polygons, but not reaching them. Length, half an inch.

Dredged in forty fathoms, on a muddy bottom, off Long Island, Grand Manan. One specimen only was found, which was adhering to a dead valve of *Pecten Magellanicus*. (*Stimpson.*)

Genus PELONAIA, Forbes and Goodsir. 1840.

Test cylindrical; orifices terminal, four-cleft, on two small, approximated, papillose eminences; mantle adherent to the test; no tentacles. Ovaries two, symmetrical.

This genus, in its cylindrical body and terminal orifices, resembles *Siphunculus* among the Echinoderms. They have relations also with the Annulosa in the transverse plaits of the respiratory sac, and in being bilateral. One of their most striking peculiarities is the perfect union of the test and the mantle. The *Pelonaiæ* live buried in mud, quite unattached to any other body, and are extremely apathetic animals, presenting scarcely any appearance of motion.

Pelonaia arenifera.

Pelonaia arenifera, Stimpson, Proc. Bost. Soc. N. H. iv. 49 (1851); Check Lists, 2 (1860).

The body is elongated, clavate, of a brownish color, and covered with grains of sand; the apertures are placed on two small, white, mammilliform protuberances at the smaller extremity. It inhabits deep water; the specimens were obtained from eighteen fathoms, about ten miles east of the Boston Lighthouse. (*Stimpson.*)

Class CONCHIFERA.*

HEAD indistinct; mouth with elongate fleshy lips or palpi. Body covered with a bi-lobed mantle, each lobe protected by a shelly valve. Gills lamellar, two on each side. Foot placed under the body, usually compressed and keeled. Valves of shells united on their dorsal edges by a ligament. Animal aquatic. Individual bisexual.

FAMILY PHOLADIDÆ, LEACH. 1819.

SHELL gaping at both ends, armed in front with rasp-like sculpture; without hinge or ligament, often strengthened by additional valves.

Genus TEREDO, LIN. 1758.

VALVES equal, largely open at both ends, forming a ring, placed at the larger extremity of a shelly tube open at both ends, and furnished with pallets.

Teredo navalis.

Principal diameters equal, posterior auricle expanded, descending much below the anterior triangle, and internally presenting a broad, appressed shelf. Pallets emarginate at tip.

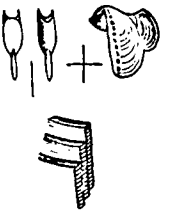
Teredo marina, SELLIUS, Hist. Nat. Tered. tab. 2, figs. 2, 3, 6.
Teredo navalis, LIN., Syst. Nat. 1267. — FORBES and HANL., Brit. Moll. i. 74, pl. 1, figs. 7, 8; pl. 18, figs. 3, 4. — HANLEY, Shells of Lin. 450. — SOWERBY, Ill. Br. Shells, pl. 1, fig. 1. — TRYON, Proc. Ac. Nat. Sc. Phil. (Sept. 1862), 468, where also may be found the synonymy in full.

This is the curious shell which is so remarkable for perforating holes in timber, giving it a honeycomb appearance. These holes

* With the few exceptions mentioned by me in foot-notes, all the text of Conchifera was prepared by Dr. Gould. — W. G. B.

are lined with their solid white tubes, at the bottom of which the shell is found. The shell itself is small, the two valves touching each other at only two points, and so much arched that when in position they form a mere ring.

Fig. 355.



T. navalis.

It is occasionally found in ship-timber, especially where it has been exposed to a tropical sea, and is familiarly known by the name of the *ship-worm*.

The above terms would apply to any species of Teredo, of which several are now recognized. The true *T. navalis*, as now understood by conchologists, seems to be very seldom, perhaps never, met with in the North Atlantic waters, where it is replaced by what is now regarded as distinct, *T. Norvagica*, the two having until recently been confounded. Its principal characters are its rather thin valves of about equal height and length; anterior auricle medium size, connected with a narrow marginal area, both of which are radiately finely grooved; posterior auricle expanded, its upper margin sloping from the beak, terminating lower down than the anterior area, divided from the fang by a channel, and internally shelving over the cavity of the shell; umbonal blade flattened and twisted, not dilated at tip. Pallets convex on one side and plane on the other, shovel-shaped, emarginate at tip, the stalk about as long as the blade. Tube solid, flexuous, not chambered.

Diameters about one fourth of an inch.

A few specimens which answer well to this description have been taken from ship-timber, but I am unable to certify as to its habitat. Its history was originally made out in great detail in Holland, where its ravages were most serious.

Teredo Norvagica.

Length short compared with height; auricles about on a level, not ascending, inner margin of wing shelf-like. Pallets shovel-shaped, with a small subterminal muscular impression.

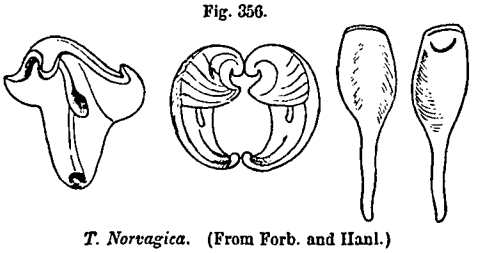
Teredo Norvagica, Spengler, Skrivt. Nat. ii. 102, pl. 2, figs. 4–6 (1792). — Forbes and Hanl., Brit. Moll. i. 67, pl. 1, figs. 1–5. — Jeffreys, Ann. and Mag. Nat. Hist. 3d ser. vi. 121. — Tryon, Proc. Acad. Nat. Sc. Philad. (Sept. 1862), 470, where also see full synonymy.

Teredo Norvegica, Adams, Genera, ii. 333, pl. 90. figs. 6*a* to *d*. — Chenu, Man. de Conch. ii. fig. 60, 61. — Sowerby, Illustr. Brit. Sh. pl. 1, fig. 2. — Woodward, Man. pl. 23, fig. 26, 27.

Teredo navalis, of all the earlier English and French naturalists.

Valves rather solid, higher than long, the two auricles terminating below at about the same level; anterior auricle rather large, its dorsal margin concave, and with fifty to sixty fine radiating striæ, the anterior marginal area quite narrow so that the grooves are very crowded and finely decussated; posterior auricle about the size of the anterior, not rising so high as the beaks, its dorsal margin sloping, concave, and a little upturned at tip, its lower junction an obtuse angle, inner boundary well defined by a shelf; umbonal blade compressed, dilated at tip. Pallets spade-shaped, squared at tip, sides nearly parallel, suddenly sloping to a stout, rounded stem about as long as the blade, one side convex with a semilunar depressed area near the tip, the other side concave, with some traces of the stem along the centre. Tube solid, somewhat chambered at its entrance by ten or twelve partitions.

Fig. 356.



T. Norvagica. (From Forb. and Hanl.)

Height, half an inch; length, one fourth less.

This is considered to be the prevailing indigenous species in the Northern Atlantic Seas, but it is rare on the American coast. It differs from the true *T. navalis* in its greater height compared with length, its larger anterior and less dilated posterior auricle, which latter forms its junction much higher up. The pallets are larger, more solid, and not emarginate at tip.

Teredo megotara.

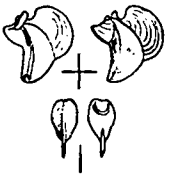
Valves as long as high, posterior auricle large and rolled outwards, its lower termination much lower than the anterior auricle, no external defining furrow, and no interior projecting shelf. Pallets ovate-quadrate, with a short, pointed style.

Teredo megotara, Hanley, Brit. Conch, i. 77, pl. 1, fig. 6; pl. 18, figs. 1, 2; iv. 247. — Jeffreys, Ann. and Mag. Nat. Hist. 3d ser. vi. 121. — Sowerby, Ill. Br. Shells, pl. 1, fig. 3. — Tryon, Proc. Acad. Nat. Sc. Philad. (Sept. 1862), 466.

Shell ivory white, diameters of the valves about equal; anterior triangle quite small, slightly upturned, joining the fang by a somewhat obtuse angle; anterior area of fang very narrow; this is followed by a narrow segment, bounded at each margin by a furrow

and subdivided by a delicate line, barred with minute lines and by more distant raised ridges, which are the terminations of the lines on the anterior fang-area; remainder of fang smooth or with minute lines of growth. Posterior auricle as high as or generally higher than the beaks, from which it is separated by a narrow and deep rounded sinus; it is broad and regularly revolute without any external furrow to mark its boundary, or any overhanging internal shelf, terminating in a shallow obtuse sinus at about the lower third of the valve, inner face with distinct concentric striæ. There are from twenty to thirty radiating grooves on the triangular area, and as many on the anterior marginal area, where they are closely crowded and beautifully decussated. The pallets are small, rounded or emarginate at tip, widening to an angle on each side, one angle a little higher than the other, then concavely narrowing into a short, pointed stalk. Tube solid, not chambered.

Fig. 357.



T. megotara.

Diameters, one fourth to one half of an inch.

Many specimens occurred living in a floating pine board covered also with large specimens of *Anatifa*, found at Newport, R. I. Others were obtained at New Bedford; also at Provincetown in cedar buoys.

The broad, uprising, revolute wing with no defining groove externally and no shelf internally, its lower junction being much lower than that of the anterior triangle, with the deep, narrow, rounded sinus between the wing and the beak, are the chief characteristics. It is now considered as distinct from *T. nana*, Turton, otherwise that name would take precedence. *T. denticulata*, Gray, seems to be a large elevated form of the same.

Teredo Thomsonii.

Shell large, claw long, posterior auricle short, not ascending so high as the beak nor descending so low as the anterior triangle, externally defined by a shallow groove, and internally overhanging the cavity of the beaks and concentrically striated.

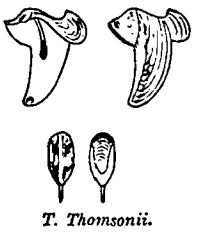
Pallets ovate-triangular, with a short style, with a marginal rim on one side enclosing a deep triangular cavity concentrically striate, and a central rib on the other.

Teredo Thomsonii, TRYON, Proc. Acad. Nat. Sc. Philad. (Oct. 1863), p. 28, pl. 2, figs. 3, 4, 5.

Valves higher than long; anterior auricle obliquely sub-triangular, inclining upwards, rather large, coarsely and deeply grooved radiately; posterior auricle small, rolling outwards, not ascending

so high as the beaks, nor extending so low down as the anterior triangular process, concave externally and separated from the body by a well-marked groove, and forming at its junction a rectangular sinus; inner face overhanging the cavity of the beaks, fan-shaped, concave, and concentrically striate. The anterior marginal area is rather broad and very minutely but deeply grooved, and separated from the rest of the fang by a sharp ridge, across which are rather distant, thin, erect, concentric laminæ, one for each groove, which fade off into the fine and more numerous lines of growth. Beak with a medium sized, oblique process. Tubercle at the point of the fang large. Sub-umbonal blade slender, a little dilated at point, curved and presenting edgewise. Pallets battledore-shaped, the blades rounded, one face having a narrow smooth rim enclosing a depressed, triangular, concentrically striate disk; the other traversed by the style; sometimes a little emarginated at tip; style a little oblique and slightly flexuous, about as long as the blade. "Tube rather thick, not concamerated." (*Tryon.*)

Fig. 358.



T. Thomsonii.

Length, one fourth of an inch; height, one third of an inch; sometimes much larger.

Originally obtained by Mr. J. H. Thomson from Cedar Buoys and the Marine Railway, New Bedford, where it lives in legions. Also from Capt. N. E. Attwood, of Provincetown, who took it from a whale-ship that had cruised in the West Indies. In its shape, auricles, size, and markings, it is almost identical with *Xylotrya bipinnata*, but differs entirely in its pallets. It also very closely resembles *T. malleolus*, a smaller species, but differs essentially in the pallets also.

Teredo dilatata.

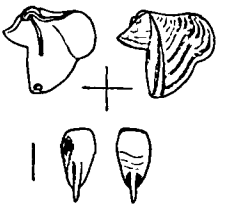
Diameters nearly equal; wing large, not ascending so high as the beak, passing off from the beak by a gentle slope, descending below the anterior triangle, having no defining exterior groove, slightly concave and then reflected outwards on the internal face. Pallets very small, battledore-shaped, end of tube concamerate.

Teredo dilatata, Stimpson, Proc. Bost. Soc. Nat. Hist. iv. 113 (Oct. 1851); Shells of N. Eng. 26. — Adams, Genera, ii. 333. — Tufts, Proc. Essex Inst. i. 26. — Tryon, Proc. Ac. Nat. Sc. xiii. 464 (1862).

"Valves white, polished; length and breadth equal; anterior [triangular] area with fine, concentric, somewhat divergent striæ,

varying in number in different specimens, and more crowded below; the slightly oblique lines on the succeeding narrow area are very minute but sharp; the next fang-shaped area is ornamented with distant, narrow, elevated, sub-imbricated, concentric lines, more conspicuous on the anterior than on the posterior half of the area; the remaining portion of the body and the auricle are smooth and glossy. The auricle is not separated from the body by any sharp angle on the posterior ventral outline, but by a gently waved sinus. A depressed line runs from the beak around to the tip of the auricle, which does not tower above the callosities of the hinge. The sub-umbonal blade is thin, tapering, and extends to about half the distance from the beak to the ventral edge. The pallets are of an angular ovate form, truncated posteriorly, where also, on the external surface, there is a small depressed area. The style of insertion is sharp, and extends in the form of a ridge for some distance on both sides after the juncture with the pallet. The tubes are very thin, strongly concamerated posteriorly in an imbricated manner.

Fig. 359.



T. dilatata.

"This species differs from *T. megotara*, Hanley, which it greatly resembles, in the smaller altitude of the valves, the greater breadth of the auricle, which is also placed much lower, and in its concamerated tubes." (*Stimpson.*)

Length and breadth of adult specimens about half an inch.

The original specimens were obtained from a pine buoy attached to lobster pots near Cape Ann, by Mr. Tufts; others from a similar source at Provincetown. They are numerous in the shipping at Marblehead. There can be no doubt that it is an indigenous species.

The pallets are very small and the style is unusually short. The other differences from *T. megotara* are so slight that I am not fully satisfied that they are distinct.

Teredo chlorotica.*

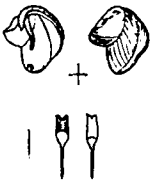
Shell minute, sub-globose, greenish, the anterior area of the claw very large; pallets with the blades lyre-shaped, posterior portion encrusted.

Shell quite small, solid, sub-globose, valves rhomboidal, greenish, beaks enveloped in the callus of the triangular area, which is large,

* Dr. Gould is to be quoted as authority for all the specific names newly proposed in this work. — W. G. B.

ascendant, obtuse at point, with about forty diverging square ribs, the interspaces finely barred; marginal area of the claw very broad, the ridges as broad as those of the anterior wing and coarsely barred, but the interspaces very narrow; at the junction of the two series is a deep diagonal groove towards which they slope; a sharp angle limits the anterior area, followed by a barred groove ray, then a very narrow posterior area with a lunate auricular projection, occupying about the middle third of the posterior margin, not reflected, its inner face concave and broadly shelving over the deep cavity of the beaks; no callosity to beaks; denticle slender, blade attached close to the denticle, linear, somewhat granulate. Pallets paddle-shaped, the stalk flexuous and very delicate, the blade half as long as the stalk, lyre-shaped, the extreme two thirds covered with a dark crust which has a projecting horn at each angle; when the crust is detached there is left a bony, acorn-shaped nucleus. Diameters about 3 millimeters.

Fig. 360.



Lyrodus chlorotica.

From timbers of ships that have cruised in the Pacific.

This species is remarkable for its minute size and globular form, its large sculptured claw-area, and its peculiar pallets, to which there is nothing similar among the species of true *Teredo*, and which have no cups or transverse segments as in *Xylotrya*. The burrows do not run in the course of the grain of the plank, but transversely, and stand thickly side by side so as to resemble honeycomb, or the organ coral, *Tubipora musica;* the tubes are lined by a thin gummy or horny coat, and terminate in a concave calcareous disk with a sort of transverse scar on its outer or convex face. I have not been able to detect any transverse partitions. If on these accounts it should be considered as entitled to generic distinction, it may be denominated **Lyrodus.**

Genus XYLOTRYA, Leach. 1830.

Siphonal pallets elongate, penniform.

Xylotrya fimbriata.

Shell subtrigonal, diameters about equal, striæ on anterior triangle about thirty; posterior auricle large, sloping from the beak and descending much below the anterior triangle, inner face fan-shaped, large, overhanging, concave, concentrically striate. Pallets oar-shaped, the blade as long as the handle.

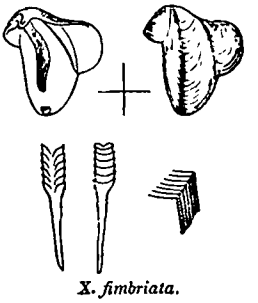
Teredo bipalmulata, Thompson, Ann. and Mag. Nat. Hist. (Oct. 1847).

Teredo palmulata, Forbes and Hanl. Brit. Moll. i. 86, pl. 2, figs. 9–11.—Sowerby, Illust. Brit. Shells, pl. 1, fig. 6.

Xylotrya fimbriata, JEFFREYS, Ann. and Mag. Nat. Hist. 3d ser. vi. 126. — TRYON, Proc. Acad. N. Sc. Philad. xiii. 478 (Sept. 1862).
Xylotrya palmulata, STIMPSON, Smith. Inst. Check Lists, 3 (1860).

Shell greenish, subtrigonal, greatest height and length about equal (length sometimes greater), anterior triangular projection as high as the umbo, tip ascending, re-entering angle about 90°; anterior marginal area broad above, sloping strongly inwards, and separated from the posterior area by a sharp, prominent angle, to which succeeds a narrow, shallow groove, bisected by a faint line; ribs on the triangular auricle and anterior area about thirty, nearly equal in width, those of the auricle finely crenulated at the sides and faintly striated across; those of the marginal area more coarsely cancellate by transverse ribs extending down into the groove; posterior auricle rather large, the upper margin sloping gently from the hinge and then, slightly excurved and recurved, ends by an obtuse notch at the lower third of the claw and far below the anterior triangle; it is also separated from the claw by a well-marked groove; its internal face is nearly as large as the rest of the shell, narrow near the umbo, gradually expanding, with an oblique termination, concave and concentrically striate, the lower margin nearly straight, sharp, and slightly detached from the claw. Ossicle at tip small. Hinge tooth small; umbonal blade falcate, tapering, compressed, sharp-edged. Pallets oar-shaped, the blade as long and about three times as wide as the slender, pointed handle, composed of ten or twelve joints shorter than broad, the divisions nearly transverse on the convex side, but inclined backward on the flat side so as to appear braided and give the margin a serrated outline.

Fig. 361.



X. fimbriata.

Diameters about one fourth of an inch. Pallets half an inch long.

Taken from one of the timbers of "Old Ironsides," which may of itself constitute a sufficient claim to be reckoned a Massachusetts shell, though probably not native.

As noted by other describers, the shell itself is so nearly like that of the true *Teredo navalis* as to be scarcely distinguishable. The pallets, however, are altogether different. As represented by others, the pallets have the braided or feather-like jointing on both faces. The variation in this may in fact entitle it to a specific distinction, and, were the pallets not subject to wide variation, would cer-

tainly do so. If we may trust the figures of the pallets, this is not the *T. palmulata* of Lamarck, as it was regarded by Forbes and Hanley.

Other specimens of another species of *Xylotrya*, about half the size of the above, were taken from a specimen of bored timber in the collection of the State. It differs also in having no developed posterior auricle, except a mere thickened rim, though there is an internal plate of large size as in *X. fimbriata*. The pallets have the style proportionally shorter and stouter, and the joints of the blade shorter, more transverse on the concave side, and the style traversing the middle of the convex side.

Fig. 352.

X. —?

Genus PHOLAS, Lin. 1758.

Shell transverse, gaping at both ends; hinge margin rolled outwards and toothless; a rib-like tooth arises from the cavity of the beaks, and shoots nearly across the shell.

Shells of this genus are generally found in logs of wood, in stones, or hard clay, which they have perforated; and they have one or more additional bony pieces on the back of the hinge.

Pholas costata.

Shell large, oblong-ovate, white, covered with radiating, toothed ribs.

Pholas costata, Lin. Syst. Nat. 1111 (1758). — Gmél. Syst. 3215. — Lister, Conch. pl. 434, fig. 277. — Gualt. Test. t. 105, fig. G. — Chemn. Conch. viii. 361, t. 101, fig. 863. — Brug. Encyc. Méth. Vers. iii. 754, pl. 169, figs. 1, 2. — Blainville, Malac. pl. 79, fig. 6. — Sowerby, Genera of Shells, No. 23, pl. 1; Thes. Conch. ii. 487, pl. 102, figs. 8, 9. — Lam. An. sans Vert. 2d ed. vi. 45. — Wood, Gen. Conch. pl. 15, figs. 1, 2; Index Test. pl. 2, fig. 4. — Adams, Gen. ii. 325, pl. 89, figs. 1, 1 *a*. — Chenu, Man. de Conch. ii. figs. 1, 2, 3. — Hanl. Ipsa Lin. Conch. 24. — Tryon, Proc. Ac. Nat. Sc. xiii. 201, where will be found a complete synonymy of the species.

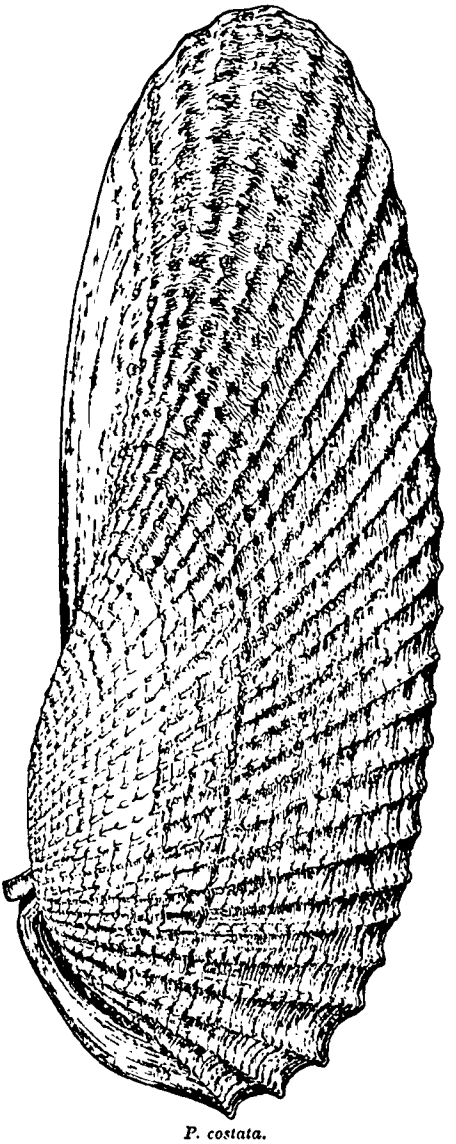
Shell large, thin, inflated, oblong-ovate, rounded before and narrowed behind, white, covered with radiating ribs, the coarse lines of growth rising over them in an undulating manner, so as to produce tooth-like elevations upon them, at regular intervals; the interior is marked with corresponding indentations. Length six inches, height and breadth two inches.

The animal is straw-colored, the tip of the siphons beautifully stippled with mahogany brown; the foot is narrow and long, like

the sole of a shoe; the supplementary valve is cartilaginous (not calcareous), spear-shaped, pointing forwards.

This well-known species is admitted into our catalogue, from the fact that Professor Adams has lately discovered an extensive bed of dead shells at New Bedford. It probably is not to be found in a living state in our waters. Indeed, I am not aware that it is found living on the shores of any of the Middle or Eastern States. It is found at the above locality, of all sizes and ages, its most delicate portions entire, forbidding the idea that these shells were transported by any means from some distant locality. It is certainly remarkable, that a large shell should have been abundant at no very distant period, which cannot now be found living within one or two thousand miles. Something of the same kind is said to belong to the history of the oyster about Cape Cod.

Fig 363.



P. costata.

[With no little surprise, I received (Nov. 26, 1845) from Thomas A. Greene, of New Bedford, a jar containing three living specimens each of *P. costata* and *P. truncata*, which were brought up by the mud-machine at the end of the Long Wharf in that place. From the number obtained in a short time he supposes they must be plentiful. He thinks they burrow two or three feet below the surface.

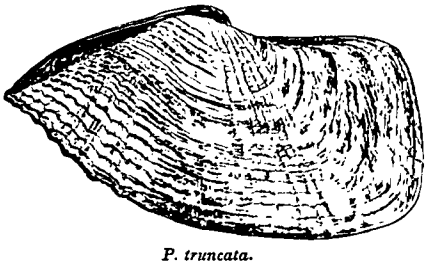
Pholas truncata.

Shell white, oblong, beaks at anterior third, anterior portion triangular, acutely pointed, posterior end broadly truncate; surface with coarse lines of growth and radiating riblets, denticulate in front, simple posteriorly, dorsal shield single, lanceolate, grooved along the centre.

Pholas truncata, Say, Journ. Ac. Nat. Sc. ii. 321 (1822). — De Kay, Moll. of New York, 248, pl. 34, fig. 223 *a*, *b*. — Gould, Proc. B. S. N. H. ii. 81. — Stimpson, Shells of New England, 25. — Sowerby, Thes. Conch. ii. 488. t. 104, figs. 29, 30. — Hanley, Descr. Catal. 6, pl. 9, fig. 56. — L. R. Gibbes, Fauna of So. Car. in Toumey's Geol. of So. Car., Append. xxii. — Fischer, Journ. Conch. 2d ser. iii. 48. — Gray, Ann. and Mag. Nat. Hist. 2d ser. viii. 381. — Jay, Catal. 4th ed. 10. — Kurtz, Catal. Shells of No. and So. Car. 3. — Tryon, Proc. Ac. Nat. Sc? xiii. 202 (1862).

Shell chalky white, oblong, with prominent lines of growth, and radiating riblets, excepting at the upper anterior margin, and a posterior superior triangle on which there is a thin straw-colored epidermis, which extends beyond the end in a long sheath; the anterior riblets sharply toothed as they cross the concentric ridges; beaks at anterior third; anterior portion triangular, acutely pointed, the lower margin concavely arched, the upper margin rolling outward, near the beaks, the ventral face with a large oval opening; posterior portion oblong, squarely truncate at the end so that the margins are nearly parallel, dorsal margin gradually opening to the end, which is entirely open. Interior smooth: rib short, rounded at insertion, a little flattened towards point, accessory valve lanceolate, square at beaks with a portion bent downwards, pointed in front, grooved along the middle with lines of growth converging to it.

Fig. 364.



P. truncata.

Length, three inches; height, one and one half inches; breadth, one and one fourth inches.

Found at New Bedford at the end of Long Wharf, in two feet mud, with *P. costata*, by Thomas A. Greene, Esq. It was not previously known this side of Carolina, where Mr. Say found it, and where it is of much smaller size. It has since been found in Long Island Sound and New Jersey.

It is much more delicate than *P. crispata*, the margins of the hinder portion much more nearly parallel; there is no furrow

across the disk, and it has a dorsal valve of which *P. crispata* is destitute.

The animal is of a dark, smoky color; the siphon is tapering, not very long, and circularly wrinkled; respiratory orifice striped alternately black and white, the latter stripes marking the presence of fourteen tentacular organs.

Genus ZIRFÆA, Leach (Gray). 1840.

Shell oval, hinge margin scarcely reflexed, joined by a horny epidermis without accessory pieces, widely gaping in front.

Zirfæa crispata.

Valves touching at the middle of the base, and widely gaping at both ends; a furrow passes from the beaks across the middle, in front of which are radiating, toothed ribs.

Pholas crispata, Linn. Syst. Nat. p. 1111 (1758). — Gmélin, Syst. p. 3216. — Sowerby, Thes. Conch. — Cuv. Regne An. (Griffiths) pl. 113, fig. 3 (animal). — Brown, Ill. Conch. 114, pl. 48, figs. 1–5. — Hanley, Rec. Sh. 7, pl. 2, fig. 5; Ipsa Lin. Conch. 26. — McGilliv. Moll. Aberd. 306. — Thorpe, Br. M. Conch. 29. — De Kay, Nat. Hist. New York, 247, pl. 32, fig. 506. — Lovèn, Ind. Moll. Scand. 50. — Forbes and Hanl. Br. Moll. i. 114, pl. 4, figs. 3–5. — Donovan, Brit. Shells, ii. pl. 62, 69. — Turton, Brit. Biv. 6; Conch. Dict. 146; Linn. Trans. viii. 32. — Hutch. Dorset Catal. 27, t. 3, fig. 4. — Wood, Gen. Conch. 81, pl. 15, figs. 3–5; Index, pl. 2, fig. 5. — Dillwyn, Descr. Catal. 40. — Deshayes, Encyc. Méth. Vers, iii. 754, pl. 169, figs. 5–7. — Lamarck, An. sans Vert. vi. 46. — Schrot. Einl. in Conch. iii. 541, No. 6. — Petiver, Gazoph. t. 79, fig. 13. — Flem. Br. An. 456.

Pholas bifrons, Da Costa, Brit. Conch. 243, t. 16, fig. 4.

Pholas latus, Lister, Conch. t. 436, fig. 279, and Append. t. 10, fig. 3.

Solen crispus, Lin., Gmel. Syst. 3228. — List. Angl. t. 5, fig. 38.

Pholas crispatus, Pennant, Brit. Zool. iv. 157, t. 43, fig. 2. — Montagu, Test. Brit. 23. — Chemn. viii. 369, t. 102, figs. 872–874.

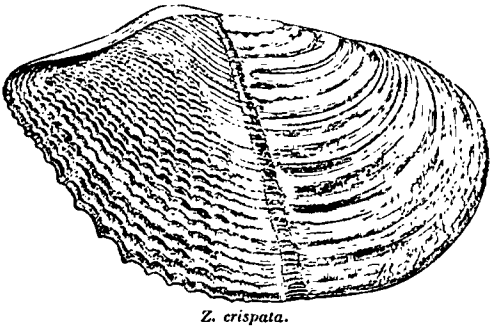
Zirphœa crispata, Chenu, Man. de Conch. ii. 6, figs. 26, 27. — Adams, Gen. ii. 327, pl. 89, fig. 5.

Zirfœa crispata, Gray, Cat. Br. Mus. (Biv.) 53.

Shell oblong-oval, thick and strong, rounded posteriorly, narrowed anteriorly into a sort of beak; widely gaping at both ends, the valves touching each other at only two points, viz. the hinge and the middle of the base. Exterior surface marked with numerous coarse, concentric ridges, which become lamellar on the anterior half; the laminæ are strongly toothed on their free edge, and the teeth are disposed in radiating series. The valves are divided into two nearly equal portions by a broad channel running from

the beaks to the middle of the base. Interior smooth, showing the external furrow, the upper and anterior edge turned outwards so as to present large, smooth callosities over the beaks. The process from within the cavity of the beaks is large, narrow, and a little flattened at the tip. Length, two inches; height, one inch and a half.

Fig. 365.



Z. crispata.

A very perfect specimen of this shell is in the cabinet of Dr. S. Bass, which was found at Phillips's Beach. Young specimens were found in hard clay at Phillips's Beach by Mr. Joseph True. They differ principally in gaping only anteriorly. Full-grown valves are occasionally thrown up on all our beaches; but it is more common at the South, as along the shores of New Jersey. When alive, a membranous expansion covers the superior border of the shell.

Nahant Beach, very large, fresh (*Haskell*); Sable Island, gigantic (*Willis*); Rimouski (*Bell*); abundant in Charleston Harbor, S. C. (*Stimpson*). It is common in all the seas of Northwestern Europe.

Family SOLENIDÆ.

Shell equivalve, greatly elongated, rather cylindrical, gaping at both ends.

Genus SOLEN, Lin. 1758.

Shell with the sides nearly parallel; beaks very small, terminal; cardinal teeth small, rounded, variable.

Solen ensis.

Shell six times as long as high, curved, front and back parallel, smooth, yellowish-green; hinge with one tooth and a sharp lateral plate of one valve entering between two teeth and a double plate of the other.

Solen ensis, Lin. Syst. Nat. 1114. — Pennant, Brit. Zool. iv. 84, t. 45, fig. 22. — Chemn. Conch. vi. 47, t. 4, fig. 30c. — Montagu, Test. Brit. 48. — Brug. Encyc. Méth. pl.

223, figs. 2, 3. — Turton, Conch. Dict. 160, t. 61.; Brit. Biv. 82. — Wood, Gen. Conch. pl. 28, figs. 1, 2; Index, pl. 3, fig. 6. — Lamarck, An. sans Vert. 2d ed. vi. 55. — Conrad, Marine Conch. pl. 5, fig. 1. — Donovan, Brit. Shells, ii. pl. 50. — Maton, Lin. Trans. viii. 44. — Flem. Br. An. 459. — Brown, Ill. Conch. 113, pl. 47, fig. 10. — Adams, Gen. pl. 92, fig. 2 (an.), 2 *a*, *b*. — Poli, Test. Sicil. pl. 11, fig. 14. — Burrows, Conch. pl. 4, figs. 3, 4. — Sowb. Conch. Man. fig. 60. — Hanl. Rec. Sh. 11. — Desh. Exp. Sc. Algér. Moll. 184, pl. 11, figs. 1–4 (animal). — Forbes and Hanl. Br. Moll. i. 250, pl. 14, fig. 2; Ipsa Lin. Conch. 30. — Lovèn, Ind. Moll. Scand. 49. — Chenu, Elem. 41, fig. 126. — De Kay, Nat. Hist. New York, 242, pl. 33, fig. 313.

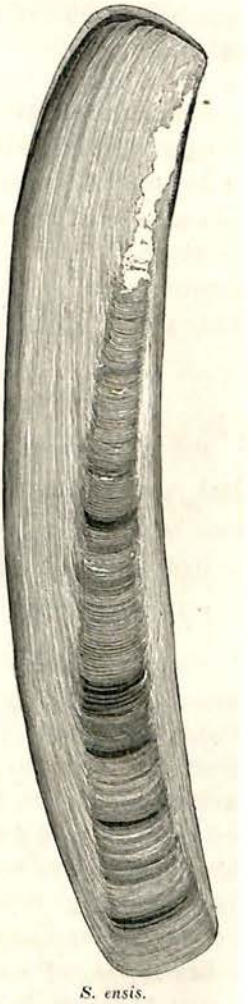
Solen curvus, Lister, Conch. t. 411, fig. 257.

Ensis major, Chenu, Man. de Conch. i. 21, figs. 87, 88.

Ensis falcata, Gray, Cat. Br. Mus. (Br. Moll.) 59.

Hypogæa falcata, Poli, ii. 251, t. 10, fig. 7.

Fig. 386.



S. ensis.

Shell scabbard-shaped; about six times as long as high, the ends rounded, the front and back nearly parallel, white within, and covered without by a glossy yellowish or brownish-green epidermis, which folds over the sharp edge of the shell. On the surface is a triangle of lines, marking the termination of the longer end at the successive stages of growth; hinge at one end; on one valve is a single tooth from which a rib or plate extends to the ligament; on the other valve are two teeth, and a double plate receiving those of the opposite valve between them; the terminations of the two ribs rise up in a curved manner and cross each other like teeth, when not broken off, as they usually are. Length of a good specimen, six inches; height, one inch. A specimen from Halifax, received from Mr. McCulloch, is eight inches long.

This well-known shell is found on both shores of the Atlantic. It lives on sandy beaches near low-water mark, as at Chelsea, Nahant, and Nantasket beaches, about Newburyport, Nantucket, &c. Eastport (*Cooper*); Sable Island and all Nova Scotia (*Willis*); Gulf St. Lawrence (*Bell*); Grand Manan, rare (*Stimpson*). It is displaced by heavy storms, and thrown up by the tide. It may often be seen at low tide projecting a little above the level of the sand, but, if touched or disturbed, it descends with astonishing rapidity

and force, much to the amazement of him who may lay hold of it, thinking to make an easy capture.

The animal is cylindrical, too long for the shell, the foot, club-shaped and obliquely truncated, projecting from one end, and the short siphons, united nearly to their fringed tips, issuing from the other. The siphons are quite short, with sixteen internal branchial cirri, and six long and six short ones to the anal opening. It is often used as an article of food under the name of *long clam*, *razor-fish*, *knife-handle*, &c. When properly cooked it is said to be among the most delicious of shell-fish. These names are enough to suggest an idea of the shell to any one who is not already familiar with it.

Some doubts have been entertained as to whether the European and American specimens belong to the same species. It is certain that our specimens are much the largest and the least slender. Five specimens, each six inches long, measured in height, English, six eighths of an inch; American, nine eighths of an inch, and this is about the usual proportion. None of the plates referred to well represent our shell. It may at least be properly designated as variety **Americanus.**

Genus SOLECURTUS, Blainville. 1824.

Shell transverse, elongated, equivalve, the beaks small, subcentral, margins nearly parallel, ends abruptly rounded; hinge with two or three cardinal teeth in each valve; ligament prominent, seated on thick callosities; pallial impression with a very deep sinus.

The above generic definition will include all the shells originally embraced in the genus by Blainville, except those of his first division, — "shells compressed, thin, with an interior rib passing from the beaks to the basal margin." An acquaintance with the animal has shown the necessity of subdividing his genus. Mr. Sowerby proposes to limit it to the species having the interior bar. But Deshayes, in his edition of Lamarck, has already limited the genus to shells of a different type; and it would, therefore, seem most proper that any new name which may be given should be applied to other forms. I have, therefore, separated those with the interior bar and other peculiarities for a new genus.

If we adopt Deshayes's modification of the genus, so that it shall

include only such as are transversely oblong-oval, covered with obliquely undulating striæ, the hinge central, &c., we shall still have left of shells another group, equally distinct in character by their sub-cylindrical, somewhat arched form, compressed at base, the extremities abruptly and usually obliquely rounded, the beaks near the posterior end, the pallial sinus very deep, &c., answering, in fact, to Mr. Conrad's sub-genus *Cultellus*. This would, of course, assume the rank of a genus in case the correctness of the above views should be acknowledged.

Deshayes says that the animal of *S. caribæus*, *legumen*, &c., approaches closely to that of the true *Solen*. But, as the genus *Solen* now admits only shells with terminal beaks, they must still be arranged under *Solecurtus*.

Of all the subdivisions which have been made of this genus, Schumacher's *Siliquaria* would most properly include the two following species. *Cultellus* had been appropriated by him before Conrad used it. The old genus *Solen* still seems to be very imperfectly subdivided.

Solecurtus gibbus.

Shell sub-cylindrical, thick, rounded posteriorly, obliquely truncated anteriorly; beaks nearest the posterior extremity.

List. Conch. t. 421, fig. 265.
Solen gibbus, Spengler, Skrivt. Nat. Selsk. iii. 104 (1794).
Solen Guineensis, Chemn. Conch. xi. 202, t. 198, fig. 1937. — Dillwyn, Cat. 62, No. 13. — Brug. Encyc. Méth. pl. 225, fig. 1. — Wood, Conch. 129.
Solen caribæus, Lam. An. sans Vert. 2d ed. vi. 58. — Hanley. Rec. Sh. 14.
Solecurtus caribæus, Conrad, Mar. Conch. pl. 4, fig. 3. — De Kay, Nat. Hist. N. Y. v. 243, t. 32, fig. 302. — Gould, Inv. 1st ed. 30. — Woodward, Man. of Moll. 316, pl. 22, fig. 9.
Solen declivis, Turt. Conch. Dict. 164, t. 22, fig. 80 (1819). — Flem. Br. An. 460. — Thorpe, Mar. Conch. 37.
Psammobia declivis, Turt. Br. Biv. 91.
Solecurtus gibbus, Forbes and Hanl. Br. Moll. i. 267. — Stimpson, Shells of New England, 22.
Macha gibba, Gray, Cat. Br. Mus. (Br. Moll.) 160.
Tagetus Dombeyi, Chenu, Man. de Conch. i. 24, fig. 108.
Siliquaria gibba, Adams, Gen. ii. 347, pl. 93, figs. 5, 5 *a*.

Shell oblong, transverse, very slightly curved, thick and strong, the upper and lower margins nearly parallel; beaks obtuse and slightly elevated, nearest the posterior end; this side is narrowest, rounded at the extremity, and having an obtuse ridge running obliquely backwards from the beaks; anterior extremity obliquely

truncated or abruptly rounded; basal margin somewhat compressed; surface coarsely wrinkled by the stages of growth, and on its disk are a few short, deep, straight scratches from the beak towards the base; the whole covered by a dense and strong yellowish epidermis, which folds over the edge. Hinge with two awl-shaped cardinal teeth in each valve, curved, ascending: behind them is a thick rounded callus, on which the ligament is fixed. Interior white, thickened; pallial impression with a sinus which passes beyond the beaks. Length, four inches; breadth, one inch; height, one and one half inches.

Fig. 367.

S. gibbus.

Found in Buzzard's Bay, at New Bedford and its vicinity, occasionally, which seems to be its northern limit. From Cape Cod southwards (*Stimpson*).

It cannot be mistaken for any other one of our shells.

Solecurtus divisus.

Shell transversely oblong-ovate, arcuated, equipartite, with a reddish stripe from the beaks passing a little backwards, designating the place of an obsolete rib within; epidermis yellowish.

Solen divisus, Speng. Skr. Nat. Selsk. iii. 96 (1794). — O. Fabr. ibid. iv. t. 10, figs. 11, 12.
Solen fragilis, Pulteney, Dorset Catal. 28, pl. 4, fig. 5 (1799). — Montagu, Test. Brit. 51, 565, Suppl. 26. — Pennant, Brit. Zool. iv. 174. — Wood, Gen. Conch. 126, pl. 29, figs. 4, 5; Index. pl. 3, fig. 11. — Dillwyn, Catal. 65. — Flem. Brit. Anim. 460.
Solecurtus fragilis, Conrad, Amer. Mar. Conch. 19, pl. 4, fig. 1. — Gould, Inv. 1st ed. 31.
Solen centralis, Say, Journ. Acad. Nat. Sciences, ii. 316 (1822).
Psammobia tæniata, Turton, Brit. Biv. 85, pl. 8, fig. 5.
Solen bidens, Chemn. Conch. xi 203, t. 198, fig. 1939 (1795). — Hanley, Rec. Sh. 16.
Solecurtus bidens, Forbes and Hanl. Br. Moll. i. 266. — Stimpson, Sh. of New England, 22.
Macha divisa, Gray, Cat. Br. Mus. (Br. Moll.) 160.

Shell small and delicate, much longer than high, sub-oval; beaks not prominent, nearly central, the upper and lower margins curved, nearly parallel, the posterior end being, however, somewhat more sharply rounded than the anterior; when viewed at the back, the shell has a peculiar compressed appearance. Surface smooth at the central region, and somewhat wrinkled at the ends; with a remarkable band of reddish purple passing from the beaks across the shell, growing wider and fainter in its progress; some fainter and broader radiations may also be seen in old shells, when the epidermis is

removed. Epidermis straw-colored, or becoming fawn-colored, slightly wrinkled posteriorly. Within livid; smooth, and shining, becoming thickened by age. The red stripe is visible within, and covered by a faint, rib-like thickening.

Fig. 868.

S. divisus.

Hinge of two large, ascending teeth on each valve, one of which, on the left valve, grows broad, and is emarginate at tip. Length, one and one half inches; height, one half inch; width, seven twentieths of an inch.

This, like the preceding species, is occasionally found at New Bedford, and other places in Buzzard's Bay. It is rather common about Rhode Island. I have never met with a specimen north of Cape Cod, though if our shell be identical with the *S. fragilis* of British writers, it is found on the Canada coasts. It differs from the fragile specimens known in British cabinets, simply in growing to a much larger size, and becoming quite thick and strong.

Genus MACHÆRA, Gould. 1841.

Shell oblong-oval, compressed, inequipartite, moderately gaping; beaks minute. Hinge with three diverging cardinal teeth in the left valve, the middle one bifid, the third one compressed, delicate, taking the direction of the margin, or obsolete; on the right valve two teeth, entering between those of the opposite valve. Within, usually crossed by a strong, vertical rib. Muscular impressions joined by a deeply sinuous pallial line. Ligament prominent.

Animal not much larger than the shell; lobes of the mantle united for about half their length, the whole of their margin pectinated with fleshy teeth, from near the siphon to the hinge, except where they pass over the foot; similar bodies are also found along their inner sub-margin, near the siphon. Labial palpi long, extending quite across the foot, pointed. Branchiæ extending to the opening of the siphon and embracing about half the breadth of the foot. Foot hatchet-shaped, dilating towards its extremity, which is obliquely truncated. Siphons united to their tips, which have scattered hairs.

The above is the description of the animal of *M. costata*. It differs from Deshayes's description of the animal of *Solecurtus strigil-*

latus, in some obvious particulars. He makes no mention of the fringe of fleshy teeth along the margin of the mantle, which are so remarkable, and which are probably retractile. The branchiæ do not enter the siphon; the foot is not linguiform, but somewhat club-shaped, and bent at a right angle within the shell; and the siphons are united entirely to their extremities, though the branchial is slightly more elongated than the anal siphon.

This genus embraces, besides the two species here described, the *Solen radiatus*, Lin. (*Solecurtus lucidus*, Conrad), *Solen maximus*, Wood (*Solecurtus Nuttallii*, Conrad), *Solen inflexus*, Wood, and *S. pellucidus* of Europe. These accord with our shells in all respects, except that the third tooth of the left valve in some of them is replaced by a marginal elevation simply. They differ in their ovate and compressed form from *Solecurtus*, and especially do they differ from sub-genus *Cultellus* by having the beaks placed anteriorly. The sinus of the pallial impression usually extends about half-way to the hinge.

Machæra squama.

FIGS. 25, 26.

Shell slightly recurved, thick, white, undulated by the lines of growth, covered with a strong, greenish-yellow, shining epidermis, corrugated at the posterior extremity.

Solecurtus squama, BLAINV. Dict. des Sc. Nat. xlix. 419.—DES MOULINS, Actes de la Soc. Lin. de Bordeaux, v. 108 (1832).
Machæra squama, STIMPSON, Sh. of New England, 22.
Machæra nitida, GOULD, Invert. 1st ed. 33 (1841).
Solen nitidus, Coll. Delessert, CHENU, Illust. Conch. pl. 8, fig. 1.

Shell thick, white, oblong-ovate, beaks small, situated at the anterior fifth of the shell, narrowed behind, rounded at both extremities; the hinge-margin is straight and somewhat compressed, and the basal margin, being at the same time regularly curved, gives the shell a somewhat recurved aspect. Epidermis thick, shining, as if varnished, of a dusky greenish-yellow or dark gamboge color, wrinkled obliquely at the posterior extremity, and projecting beyond and folding around the edge of the shell. Lines of growth broadly and prominently rounded, giving a wavy appearance. Within white and strengthened by a prominent rib, which extends from the beaks, inclining very slightly backwards, and, expanding, loses itself in the shell about half-way across the valve. Hinge having the teeth seated upon the base of the rib; in the left valve

three; the first strong, ascending and curved, the second still stronger and widely branched, one branch being erect, the other nearly prostrate, the third very much compressed, delicate, at right angles with the first and directed parallel to the margin, just under the ligament; on the other valve two teeth, the first prominent, a little oblique, the other very thin and oblique, entering between the middle and last tooth of the opposite valve. Ligament quite protuberant. Height, one inch and one fifth; length, two inches and four fifths; width, three fifths of an inch.

Fig. 369.

Machæra squama.

Not unfrequently taken from the stomachs of codfish caught at the Banks, and sometimes off our shores. Bank Fisheries (*Stimpson*).

This species differs from all its co-species by the inclination of the rib towards the longer side of the shell, and also by its apparent upward curvature. It is, however, very closely allied to the shells figured by Wood and Conrad.

It is very rare to find all the teeth entire. The two thin teeth next the ligament are almost always broken; but a careful examination will discover their vestiges; and they never seem to be obsolete. The erect tooth of the left valve is not unfrequently broken, and perhaps one of the branches of the bifurcated tooth. The large tooth of the right valve is most constant.

Machæra costata.

Shell thin, smooth, shining; epidermis greenish, zoned, and radiated with livid-violaceous; internal rib inclining forward.

Solen costatus, Say, Journ. Acad. Nat. Sc. ii. 315 (1822). — Valenc. in Chenu, Ill. Conch. pl. 8, fig. 2.

Solecurtus costatus, Say, Amer. Conch. pl. 18. — Conrad, Amer. Mar. Conch. 21, pl. 4, fig. 2.

Solen Sayii, Griffiths Cuv. xii. pl. 31, fig. 3.

Solen (*Solecurtoides*) *Nahantensis*, Des Moulins, Actes de la Soc. Lin. de Bordeaux, v. 109 (1832).

Machæra costata, Gould, Inv. 1st ed. 34 (1842). — Middend. Malac. Ross. iii. 78, t. 21, figs. 4–10. — De Kay, Nat. Hist. New York, 244, pl. 32, fig. 301. — Stimpson, Shells of New England, 22.

Shell ovate-elliptical, thin, fragile, smooth and diaphanous; beaks very minute, placed at the anterior fourth of the shell; posterior portion very little pointed, its upper margin compressed and somewhat crested; basal margin sometimes a little contracted; elsewhere regularly arcuated. Epidermis very smooth and shining, of a light yellowish-green color blended with livid-violaceous in such a manner as to form three radiated compartments of each color. There are minute wrinkles about the posterior extremity, and minute series of them across the middle of the shell, arranged so as to appear like radiating lines. Within livid, and somewhat iridescent. Rib white, inclining backwards, and extending about two thirds across the valves. Teeth as in the preceding species, excepting that the branch of the bifurcated tooth is less prostrate. The same remark as to their deficiencies applies to this species as to the other. Height, three fourths of an inch; length, seven twentieths of an inch; width, three tenths of an inch.

Fig. 370.

M. costata.

Found abundantly upon every sandy beach, and probably inhabits the sand in shallow water. Whole coast (*Stimpson*); Fishing Banks (*Willis*); Rimouski, common (*Bell*). It is one of our most beautiful shells. It is much more delicate and smaller than *M. squama*. The radiations of color are evident, but have no very distinct dividing lines; a whitish, narrow ray, running obliquely backwards, and another answering to the interior rib, are generally conspicuous. The colors are also arranged in zones, as well as rays.

Genus SOLEMYA, Lam. 1818.

Shell equivalve, inequipartite, elongated; epidermis thick and shining, projecting far beyond the margin; beaks inconspicuous; hinge margin widened and excavated to form a receptacle for a cartilage, usually resting on a rib-like support.

Solemya velum.

Shell oblong, very thin and fragile, epidermis pale yellowish-brown, marked with radiating lines; within purplish-white; cartilage-support arched, the points directed across the shell.

Solemya velum, Say, Journ. Acad. Nat. Sc. ii. 317 (1822). — Gould, Inv. 1st ed. 35. — De Kay, Nat. Hist. New York, 245, pl. 30, fig. 292. — Stimpson, Shells of New England, 21.

Shell remarkably thin and fragile, oblong, rather broadest behind; very inequipartite, upper and lower margins nearly parallel, ends rounded; beaks in no degree elevated, but having a slight pit in front of them; surface of the valves radiated with about fifteen slightly impressed, double lines, most conspicuous posteriorly, and most widely separated across the middle; short end distinctly wrinkled by the lines of growth; epidermis light yellowish-brown or chestnut-color, firm, elastic, glossy, at the hinge margin connecting the valves together for nearly their whole length, and elsewhere projecting far beyond the margin of the calcareous portion, and slit at each of the radiating lines, whence the edges have a ragged, fringed appearance, the angles of the lobes rounded; hinge toothless, consisting of a large triangular receptacle for the cartilage, in each valve, resting on, and partly enclosed by, a whitish bony support, arched beneath, the legs of the arch partly enclosing the anterior muscular impression, and the hinder branch directed nearly across the shell. Length, one inch; height, half an inch; breadth, three tenths of an inch.

Fig. 371.

S. velum.

The foot of the animal protrudes behind and expands; is obliquely truncated, and the edges expand into two lobes which are serrated at the edges; the whole foot may assume a multitude of forms, and the points of the serratures be prolonged into a fringe; there is an opening in the mantle for the passage of water, the edges fringed, and two of the fibrils are longer than the others; branchiæ large, thick, situated far back, each leaflet with a midrib; palpi triangular, long-pointed. Dr. Stimpson states that he has seen the animal leaping and swimming about in the water for some time, without touching bottom. The leap is performed by suddenly drawing in the umbrella-shaped foot, at the same time that water is expelled from the posterior opening by the closing of the valves.

Found upon Chelsea, Nahant, Nantasket, and other sandy beaches, generally in the early months, and some years in great abundance. At Dartmouth harbor, Professor Adams found them in mud, far beyond low-water mark. Fishing Banks (*Willis*); whole New England coast (*Stimpson*).

It is an exceedingly delicate and curious shell; its epidermis, hanging over the edges like a veil, at once distinguishing it. The dimensions, given above, include the epidermis, and are those of a shell of the largest size. In the younger stages the border of the

epidermis is entire. The bony substance of the valves is so thin, that the lighter-colored radiations are quite obvious within.

Its special distinguishing marks will be more particularly pointed out in the description of the next species.

Solemya borealis.

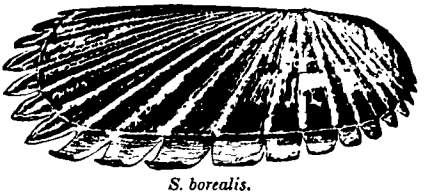
Shell fragile, oblong; epidermis dark brown, with fifteen to twenty lighter radiating lines; within grayish-blue; cartilage-support forked, the hinder branch directed obliquely forwards.

Solemya borealis, TOTTEN, Silliman's Journ. xxvi. 366, fig. 1. — STIMPSON, Shells of New England, 21.
Solemya velum, CONRAD, Amer. Mar. Conch. pl. 66, fig. 16.

This shell would be described in terms so similar to those employed for the preceding species, that a notice of those points in which they differ will be the best description.

It greatly excels in size; the smallest that has been noticed exceeding the largest *S. velum*. The valves are less convex, and very much more solid, and their color within is always a grayish-blue or lead-color; the basal margin is a little arched inwards; the ends are a little scalloped, there being a slight projection corresponding to each fissure of the epidermis; the cartilage-support instead of being arched is forked, and the hinder branch is directed obliquely forwards, extending half-way to the anterior margin; the epidermis is always of a very dark brown or tar-color, marked with fifteen to twenty radiating lines; the projecting margin is slashed as in the other species, but the angles of the lobes are not rounded, their edges have a thinned, crimped margin, and are usually rolled back.

Fig. 372.



S. borealis.

Chelsea beach is the only locality in Massachusetts, that I know of, where this species has been found. A very large and perfect specimen was found there by Mr. J. P. Couthouy, and is now in the cabinet of the Boston Society of Natural History. Colonel Totten found it in considerable numbers in the vicinity of Newport. Whole coast of New England (*Stimpson*); Nahant beach (*Haskell*); Fishing Banks (*Willis*).

Only two other species of this genus have been described; the

S. Mediterranea from the Mediterranean, which is distinguished from all the others by wanting the callous supports of the cartilage, and the *S. australis* from New Holland, which has the size and strength of *S. borealis*, and the color of *S. velum*. A notch in the hinge margin behind the cartilage is also spoken of, which we do not find in *S. borealis*. It is not a little remarkable that a genus embracing so few species should be so widely distributed.

Genus PANOPÆA, Menard. 1807.

Shell equivalve, transverse, unequally gaping at the sides and at the base; a small, conical tooth on each valve, and a rounded callosity at each side to which the ligament is affixed.

Panopæa arctica.

Fig. 27.

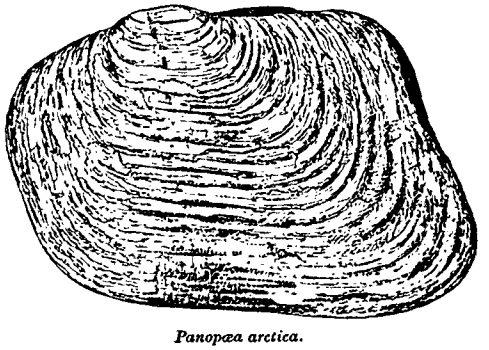
Shell oblong, sub-cylindrical, strong, widely gaping at both ends, rounded anteriorly, truncated posteriorly, traversed by two radiating, wave-like ridges, which divide the surface into three nearly equal portions.

Mya Norvegica, Spengl. Skrivt. Nat. Selsk. iii. 46, pl. 2, fig. 18.
Glycymeris arctica, Lam., An. sans Vert. 2d ed. vi. 70. — Spengl. Actes de la Soc. d'Hist. Nat. Copenh. 45, pl. 2, fig. 18.
Panopæa Glycymeris, Bean, Mag. Nat. Hist. viii. 562, figs 50, 51. — Turt. Br. Biv. 42.
Panopæa arctica, Gould, Inv. 1st ed. 37. — Hanley, Rec. Sh. 18, Suppl. 10, fig. 43; Br. Mar. Conch. 38. — De Kay, Nat. Hist. N. Y. 246.
Panopæa Spengleri, Valenc. Arch. du Mus. i. 15, pl. 5, fig. 3 (poor). — Chenu, Ill. Conch. (Pan.) 4, pl. 4, fig. 4; Man. de Conch. ii. 27, fig 118.
Panopæa Norvegica, Lovèn, Ind. Moll. Scand. 49. — Forbes and Hanl. Br. Moll. i. 174, pl. 11, pl. w. (anim.) Suppl. — Woodward, Pr. Z. S. 220 (1855). — Adams, Gen. ii. 351, pl. 94, figs. 3 3*a*, 3*b* (anim.) — Middend. Siber. Reise (Moll.) 109; Malac. Ross. pt. iii. 77, pl. 20, fig. 11.
Saxicava Norvegica, Woodw. Man. of Moll. 319 (1851); Proc. Z. S. 220 (1855). — Möller, Moll. Grœnl. 18.

Shell thick and strong, oblong, somewhat cylindrical, inequilateral, the posterior portion being nearly twice the length of the anterior; somewhat acutely rounded before, obliquely truncated, and widely gaping behind, the posterior margin thickened within, and turning outwards; the hinge and basal margins are usually about parallel, but in old shells the lower and posterior angle is considerably prolonged, so as to render this portion broadest, and it is the only point at which the valves meet, the rest of the base widely gaping; beaks rather prominent, directed slightly forwards, and from them extend two broad, wave-like ridges, one directed to the

lower posterior angle, the other dividing the portion anterior to this into two nearly equal parts, so that the surface is thus divided into three triangular, concave compartments; surface also ridged at the lines of growth. Directly under the beak in each valve is a single small, triangular tooth; these shut side by side; running backwards from each of them, along the margin, is a thick, rounded, crest-like callus, having a groove at its external base in which a strong ligament is fixed, which arches over these crests. Muscular impressions deep; pallial impressions looking like an irregular series of muscular pits of various sizes; interior smooth and shining, corresponding to the external undulations; exterior antiquated, livid, covered with a thick, dusky epidermis, wrinkled posteriorly. Length, two and one half inches; height, one and three fifths inches; breadth, one and one tenth to one and six tenths inches.

Fig. 373.



Panopæa arctica.

Inhabits the banks of Newfoundland, whence it is brought by fishermen. Throughout the arctic seas from Behring's Straits to Newfoundland, the North Sea, and Russian Lapland (*Woodward*); Arctic Seas of Europe (*Middend.*); dredged in Bedford Basin, Halifax (*Willis*); taken (dead) in forty fathoms, Grand Manan (*Stimpson*).

I believe this to be the shell which Lamarck intended by his *Glycymeris arctica*, and which Deshayes, with good reason, pronounces to be a PANOPÆA. I am aware that the *P. Aldrovandi* varies much at different ages, and has consequently been described under several names. It is also said to be an inhabitant of Newfoundland, while Lamarck gives the "Arctic Ocean, the White Sea," as the habitat of *P. arctica.* But *P. Aldrovandi* never presents upon the disk the two ridges and intervening central valley, so characteristic of our shell, it is also nearly equilateral, broadest before, and the anterior extremity is scarcely more rounded than the posterior, and, even at the immense size to which that species often arrives, it is scarcely more thickened than our small shell,

which, indeed, bears evidence of entire maturity. The "costis duabus obtusis," and the remark, that "externally it resembles Mya truncata," are enough to identify the shell. A single valve would be passed over as the toothless valve of *Mya truncata*.

It is an interesting shell on account of the genus being found plentifully on both continents in a fossil state, while recent specimens are so rare.

[I have retained this shell in the genus *Panopæa*, although Woodward and Hancock have shown that the animal belongs rather to *Saxicava*, and the pallial impression consists also of a series of elongated dots as in that genus.

Genus GLYCYMERIS, Lam. 1801.

Shell elongated, inequipartite, greatly gaping at both ends; hinge margin callous, without a tooth; ligament external, epidermis thick, extending beyond the margin of the shell.

Glycymeris siliqua.

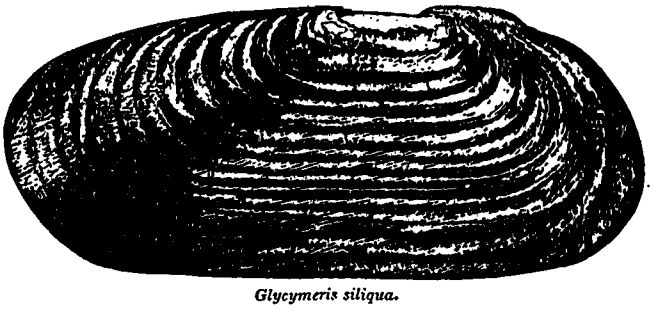
Shell elongated, oval; epidermis black, dense, and shining, obliquely wrinkled; beaks eroded; interior loaded with thick callus.

Mya siliqua, Chemn. Conch. xi. 192, pl. 198, fig. 1934. — Dillwyn, Catal. i. 49.
Glycymeris incrassata, Lam. Syst. des An. sans Vert. 126.
Glycymeris siliqua, Lam. An. sans Vert. 2d ed. vi. 69. — Blainv. Malac. pl. 80, fig. 3. — Audouin, Ann. des Sc. Nat 1833, pl. 14, 15, 16 (excellent). — Sowerby, Gen. of Shells, No. 8. — Desh. Encyc. Meth. Vers, ii. 171. — Chenu, Man. de Conch. i. 30, figs. 1–6. — Reeve, Elem. of Conch. ii. 161, fig. 234. — Woodw. Man. of Moll. 320, pl. 21, fig. 14. — Stimpson, Shells of New England, 24.
Mya picea, Wood, Gen. Conch. 96, pl. 22, fig. 5; Index, pl. 2, fig. 10.
Cyrtodaria siliqua, Woodw. Ann. and Mag. xv. 99. — Adams, Gen. ii. 352, pl. 94, figs. 4, 4 *a*, 4 *b*.

Shell long, oval, ponderous, widely gaping at both ends, surface undulated at the different stages of growth; covered with a thick, horny, glossy-black epidermis, which projects a considerable distance beyond the limit of the valves; it is obliquely wrinkled at various parts, especially at the posterior end; beaks not prominent, always more or less eroded; ligament large and protuberant; interior of the shell white, loaded with a very thick mass of calcareous substance, giving the shell great weight, its margin having a somewhat fringed arrangement. Height, one and one half inches; length, three and one half inches; breadth, one inch.

The animal is much larger than the shell; mantle closed throughout except for the issue of the foot, and an opening for the siphons, which are united to the end, and enveloped in a thick muscular

Fig. 374.



Glycymeris siliqua.

tissue continuous with the mantle; foot rather small, conical; branchiæ two-leaved each side.

Its proper habitat is the Banks of Newfoundland; but several fine specimens have been hooked up or dredged in the neighborhood of Provincetown, within the Cape. Nahant Beach, after storms (*Haskell*); Halifax, Sable Island (*Willis*); Rimouski, Marcouin (*Bell*).

It is a very interesting shell, the only living one of the genus yet known. Its wide gaping, thick interior deposit, toothless hinge, and black exterior, render it impossible to confound it with any other shell. The great size of the animal, which the shell can never enclose, renders it a welcome morsel for that denizen of the Banks, the cod-fish; and, accordingly, it is not difficult to obtain specimens through the fishermen. In young shells the epidermis is smooth, and of a light chestnut-color.

Family MYADÆ.

Shell often inequivalve, inequipartite, gaping; hinge with a more or less spoon-shaped tooth in one valve, received into a corresponding excavation in the opposite valve, united by an interposed cartilage.

Genus MYA, Lin. 1747.

Shell transverse, gaping at both ends; left valve with a single broad, compressed, erect tooth, received into a pit in the opposite valve.

Mya arenaria.

Shell elongated ovate, chalky-white, covered with a thin, wrinkled epidermis; tooth of equal length and breadth, inclined a little backwards and downwards, with an oblique rib on the back.

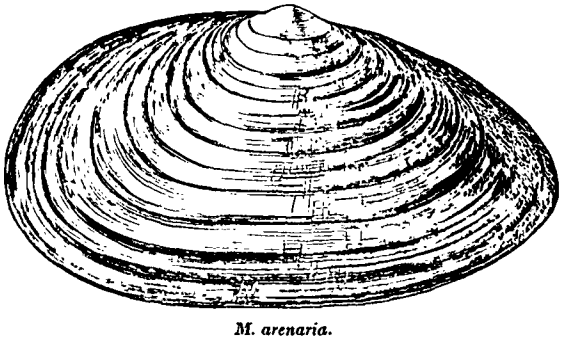
Mya arenaria, Lin., Syst. Nat. p. 1112. — Lister, Conch. t. 419, fig. 263. — Pennant, Brit Zool. iv. 79, t. 42, fig. 16. — Chemn. Conch. vi. 10, t. 1, figs. 3, 4. — Fabr., Faun. Grœnl. 405. — Spengler, Skrivt. Nat. Selsk. iii. 30. — Dillwyn, Catal. i. 42 — Blainville, Malac. pl. 77, fig. 1. — Sowerby, Gen. of Shells. No. 32. — Montagu, Test. Brit. 30. — Wood, Gen. Conch. 91, t. 17, fig. 3; Index. pl. 2, fig. 2. — Desh., Encyc. Méth. Vers. iii 592, pl. 229, fig. 1. — Lam. An. sans Vert. (Desh. ed.) vi. 74. — Maton and Rackett, Lin. Trans. viii. 35. — Turton, Conch. Dict. 98; Brit. Biv. 32. — Donov. Brit. Sh. iii. 92, t. 85. — Fleming, Brit. An. 463. — Conrad, Amer. Marine Conch. 42, pl. 9, fig. 1; Lin. Trans. viii. 35. — Brown, Conch. Ill. Gr. Brit. 111. pl. 45, fig. 1; Mar. Conch. pl. 4, fig. 1. — Hanley, Rec. Sh. 19; Ipsa Lin. Conch. 27. — Forbes and Hanl., Br. Moll. i. 163, pl. 10, figs. 1, 2, 3, pl. H. fig. 1 (animal). — Reeve, El. Conch. ii. 158, fig. 229; Conch. Syst. pl. 33. — Mawe, Conch. pl. 4, fig. 1. — Adams, Gen. ii. 353, pl. 95, figs. 1, 1 *a*, 1 *b* (anim.). — Chenu, Man. ii. 31, figs. 128, 129. — Middend. Siber. Reise (Moll.) 108; Beitr. z. Mal. Ross. iii. 70, pl. 20, figs. 1–3. — De Kay, Zool. New York, 240, pl. 30, fig. 290. — Woodw., Man. of Moll. 244, fig. 170 (anim.). — Gray, Cat. Br. M. (Brit. Moll.) 69. — Möller, Ind. Moll. Gr. 17. — Collections Mass. Hist. Soc. viii. 193 (1802).

Mya mercenaria, Say, Journ. Acad. Nat. Sc. ii 313 (1822).

Mya acuta, Say, Ibid.

Shell ovate, equivalve, nearly equipartite, moderately thick, gaping at both ends, especially at the posterior, which cannot be closed on account of an outward curvature of the valves; anteriorly short-

Fig. 375.



M. arenaria.

est and regularly rounded; posteriorly narrowed and rounded; surface wrinkled, and in some parts raised into ridges at the lines of growth; faint radiating lines and colors depart from the beaks; color dingy white, covered with a very thin, dirty-brown epidermis,

irregularly wrinkled; beaks small, pointed, slightly curved forwards, directly under which, in the left valve, rises an erect tooth, rounded at its summit, of about equal breadth and height; its inner face is smooth and rounded; its outer face is divided into two portions, the largest of which is spoon-shaped, the other flat and traversed across the middle by a grooved ridge which projects beyond the margin of the tooth like a smaller tooth; on the right valve we have a deep excavation imbedded in the cavity of the beak; in this and in the concave portion of the tooth is fixed the very strong cartilage; anterior muscular impression narrow and long, club-shaped; posterior one semi-oval; pallial impression scalloped along the base, and very deeply notched behind. Common length, three and one half inches; height, two inches; breadth, one inch. I have a specimen, the corresponding dimensions of which are five and one half, three and four tenths, two and one tenth inches.

This shell (the Clam, not of New York and Philadelphia) is familiar to every one who resides on the sea-coast. It is always to be seen in every market, and on every quiet shore. Its residence is always between high and low tide, or in such places as allow it to be partially exposed to the air a part of the time. Such are our sandy beaches, muddy inlets, and mouths of streams emptying into the sea, &c. It usually lies just below the surface, and over it is a round hole through which the animal occasionally ejects a jet of water to a considerable height above the sand; and, if the shallow water is observed where they are known to dwell, it will be perceived to be kept in constant eddies by the suction and ejection of the water.

There seems to be no character which affords any ground for separating our shell from the European clam. Mr. Say, as he merely refers to Pennant's figure, had probably never seen a specimen from across the Atlantic. A comparison would certainly have saved him from the error of describing it as a new species. Nor can I believe there is any occasion to make two species, the *mercenaria* and *acuta*, as he has done. His *acuta* was formed from a specimen in which the posterior extremity was very acute; but in this part we find great diversity of proportions in different specimens. It is found far up the St. Lawrence River, where it grows smaller and smaller, as it always does in proportion to any admixture of fresh water. It is found along the whole coast of Nova Scotia (*Willis*) and Labrador (*Packard*); Cape Hope, James's

Bay, 52° 10′ N. (*Drexler*); Greenland (*Möll.*); Drontheim to Cape North (*M'Andrew*). Abundant as a pleistocene fossil throughout the North.

It seems not to be a common shell at the British Islands, and to be seldom used as food there.

Its surface is often colored by the earth in which it is found. Very often it has a rusty color, or a bluish clay-color; and the solidity of the shell varies according to its exposure to the chafing of the sea. Some specimens obtained in the still, sandy harbor of Provincetown are very white, and nearly as thin as paper.

In the young shell the valves are quite unequal, and the tooth is produced towards the longer side, so as to be somewhat triangular. I have compared shells in this state, a third of an inch in length, with specimens of *Sphenia Swainsoni*, Turt., and can find no differences in the hinge, and none in the shell, unless that perhaps the latter may be a little thinner, and proportionally longer than the former. [*S. Swainsoni* is regarded by British writers as the fry of *M. truncata*.

NOTE. — The clam has found its place in our literature, and the following scraps may not be inappropriate here.

"The Indians were very fond of clams, which they called *sickishuog*. This is a word with a plural termination. If the author might be allowed to revive an old term, he would denominate the common or small clam the *sicki*." — *History of Orleans, in Coll. Mass. Hist. Soc.* viii. 193 (1802).

"And is there a mind for a delicate dish?
We repair to the clam-banks and there we catch fish."
Forefathers' Song, about 1630.

"Clams — white. Their broth is most excellent in all intermitting fevers, consumption, etc. These clams feed only on sand." — *John Winthrop, in Journal of the Royal Soc.* 1634.

"The times wherein old Pompion was a saint,
When men fared hardly, yet without complaint,
On vilest cates; the dainty Indian maize
Was eat with clamp-shells, out of wooden trays."
B. Thompson, New England's Crisis, 1675.

"SONNET TO A CLAM.

"'Dum tacent clamant.'

"Inglorious friend! most confident I am
Thy life is one of very little ease;
Albeit men mock thee with their similes,
And prate of being 'happy as a clam'!
What though thy shell protects thy fragile head
From the sharp bailiffs of the briny sea?
Thy valves are sure no safety-valves to thee,

While rakes are free to desecrate thy bed,
And bear thee off, — as foemen take their spoil, —
Far from thy friends and family to roam;
Forced, like a Hessian, from thy native home,
To meet destruction in a foreign broil!
Though thou art tender, yet thy humble bard
Declares, O clam! thy case is shocking hard."

John G. Saxe.

Mya truncata.

Shell oblong-oval, inequilateral, rounded anteriorly, truncated posteriorly; widely gaping; tooth broader than long.

Mya truncata, Lin. Syst. Nat. 1112; Gmél. No. 1. — Fabr. Fauna Grœnl. 404. — Pennant, Brit. Zool. iv. pl. 41, fig. 14. — Chemn. Conch. vi. 8, t. 1, figs. 1, 2. — Montagu, Test. Brit. 32. — Maton and Rackett, Lin. Trans. viii. 35. — Wood, Gen. Conch. 90, t. 17, figs. 1, 2; Ind. Test. pl. 2, fig. 1. — Dillwyn, Catal. i. 42; Rec. Sh. 42. — Deshayes, Encyc. Méth. iii. 591, pl. 229, fig. 2. — Donovan, Brit. Shells, iii. pl. 92. — Lam. An. sans Vert. 2d ed. vi. 73. — Turton, Conch. Dict. 97; Brit. Biv. 31. — Lister, Conch. t. 428, fig. 269. — Gualt. Test. t. 91, fig. D. — Brooke, Introd. pl. 1, fig, 10. — De Kay, Nat. Hist. New York, 240, pl. 29, fig. 289. — Brown, Ill. Conch. G. Br. pl. 10, fig. 2; 2d ed. pl. 45, fig. 2. — Hanley, Rec. Sh. pl. 2 (Mya), fig. 2; Ipsa Lin. Conch. 27. — Sowerby, Conch. Man. fig. 71. — Crouch, Intr. Conch. pl 3, figs. 6, 7. — Burrows, Elem. pl. 4, figs. 1, 2. — Forbes and Hanley, Br. Moll. i. 163, pl. 10, figs. 1, 2, 3, pl. H. fig. 1 (anim.). — Woodw. Man. Moll. 317, fig. 220 (with anim.). — Lyell, Tr. Geol. Soc. Lond. vi. 137, pl. 16, figs. 5, 6 (1841). — Middend. Beitr. z. Mal. Ross. iii. 69, pl. 19, figs. 13–15; Sibirische Reise (Moll.), 106, pl. 25, figs. 11–14. — Chenu, Elem. 48, fig. 152. — Gray, Cat. Br. M. (Brit. Moll.) 68. — Lovèn, Ind Moll. Scand. 49. — Möller, Moll. Grœnl. 17. — Stimpson, Shells of New England, 24.

Mya priapus vel *Mentula Marina Stelleri*, Tilesius, Mem. de l'Acad. de St. Petersb. viii. 295, t. 9.

Mya Uddevalensis, Forbes, Hancock, Ann. and Mag. N. H xviii. 337 (1846) (fossil).

Sphenia Swainsoni, Turt., Br. Biv. 37, pl. 19, fig. 2 (the fry).

Shell oblong, inequipartite, longest and rounded before, narrower and abruptly cut off, generally obliquely, behind; the valves are strong, deeply concave and often unequal, but sometimes the right valve, and sometimes the left, is most prolonged; surface irregularly ridged along the lines of growth; color dingy white, covered with a thick, tough, yellowish, wrinkled epidermis, which folds over the edges of the shell, and is greatly prolonged posteriorly, forming a tube six or eight inches long, supplying in some measure the apparent loss of protection to the animal by the truncation of the shell. The truncated edges are a little flaring, and the shell is left wide open behind; beaks moderately prominent, turning slightly forwards; teeth broader than long, projecting a little inwards; inner face smooth, and nearly flat; outer face similar to that of *M.*

arenaria, but the oblique rib merely forms a thickened lobe at the edge, and does not project into a tooth-like process; on the opposite valve is an excavation in the beak for the reception of the tooth, and insertion of the ligament. Length, two and three quarters inches; height, one and seven tenths inches; breadth, one and one fifth inches.

Fig. 376.

Mya truncata.

The animal is oval, with very long siphons united to their fringed tips, and covered with a wrinkled, brown epidermis; mantle closed, except for the passage of a small slender foot with a byssal groove.

Single valves of this shell are thrown upon our beaches by violent gales; but I have never heard of any living specimen being taken directly on our coast. At George's and Grand Banks, however, it is abundant, and is a favorite food of the codfish, from whose stomachs it is taken plentifully by our fishermen. On the English coast it is spoken of as more plentiful than *M. arenaria*, found at the mouths of rivers. It is not mentioned as an article of food. Eastport, at low water, and southward to Cape Cod (*Stimpson*); Bedford Basin, Halifax (*Willis*); Greenland (*Möller*); Port Foulke (*Hayes coll.*); var. *Uddevalensis*, abundant, Gulf of St. Lawrence (*Bell*). Fossil at Montreal, Beauport, Portland, and elsewhere.

It is very easily recognized by the peculiar manner in which the posterior end seems to be chopped off; sometimes directly across, and sometimes obliquely; sometimes leaving the posterior portion of about the same length as the anterior; and at other times not half as long. Its membranous tube, when not broken off by the removal of the animal, as it usually is, is quite a curiosity. There is one shell which at first sight resembles it, the *Panopæa arctica;* but it is gaping at both ends, and has no tooth.

Family CORBULIDÆ.

Shell inequivalve, thick, solid, slightly gaping anteriorly; hinge with a prominent, conical, recurved tooth, received in a notch of the opposite valve.

Genus CORBULA, Brug. 1792.

Shell inequivalve, inequipartite; hinge with a small, upright, conical tooth in each valve, one received into a pit by the side of the other; cartilage between the teeth.

Corbula contracta.

Fig. 37.

Shell small, white, valves sub-equal, covered with numerous concentric, elevated lines; rounded before, somewhat acute behind; basal margin contracted at the middle.

Corbula contracta, Say, Journ. Acad. Nat. Sc. ii. 312 (1822.)—Reeve, Conch. Icon. pl. 4, fig. 27.—De Kay, Nat. Hist. New York, 241, pl. 28, fig. 285.—Stimpson, Shells of New England, 24.
Corbula æquivalvis, Philippi, Wiegm. Archiv. 1836, 227, pl. 7, fig. 4.

Shell small, ovate-globose, white, nearly equipartite, shortest and rounded before, narrowed and somewhat pointed behind, basal margin contracted and arched near the middle; surface beautifully plaited with regular, smooth, rounded, concentric ridges; beaks rather prominent, inclined forwards; a distinct angular ridge running from them to the posterior extremity defines a broad rhomboidal space; left valve nearly as large and convex as the right, though still shutting considerably within it. Hinge tooth slender, erect; within smooth; impressions very faint. Length, two fifths of an inch; height, one fourth of an inch; breadth, one fifth of an inch.

Fig. 377.

C. contracta.

Found at Martha's Vineyard, in the neighborhood of New Bedford, &c. It is abundant about Rhode Island, and is also an inhabitant of the coasts of Georgia and East Florida.

This species is remarkable for the equality of its valves; but still they are unequal enough to attract notice at once. The regular and beautifully rounded ribs are also quite characteristic. It bears a close resemblance to *Cumingia tellinoides* in its exterior.

Genus NEÆRA, Gray. 1834.

Shell pear-shaped, inequivalve, thin, usually radiately ribbed, beaked and gaping posteally, with an internal rib; hinge with an oblique ledge, a minute tooth contiguous, and an obsolete lateral tooth; animal with closed mantle, small crescentic foot; siphons short, contracted, upper one smallest and with an extensile valve, both with a few long filaments at their sides.

Neæra pellucida.

Neæra pellucida, Stimpson, Inv. Gr. Manan, 21, fig. 13 (1853).

Shell small, thin, pale white, sub-ovate, swollen anteally and contracted posteally into a short but distinct rostrum. Beaks small, tumid, and placed a little before the middle. Surface nearly smooth about the beaks, with irregular, distant striæ of growth near the margin, which become sharp and well marked on the rostrum. Within smooth and glossy, with minute radiating lines across the disk; teeth very minute. Epidermis white, sometimes pale greenish on the beaks and brownish on the rostrum. Length, nineteen hundredths of an inch; height, twelve hundredths of an inch; width, eleven hundredths of an inch. A specimen from Casco Bay measures length, five tenths of an inch; breadth, eighteen hundredths of an inch; height, three tenths of an inch.

Fig. 378.

N. pellucida.

The above description is copied from Dr. Stimpson, who discovered this species, the first found on our coast. It resembles *N. cuspidata*, Forbes and Hanley. It was taken in forty fathoms, on a muddy bottom, off Long Island. Also in a haddock taken near Portland (*Fowler*).

Family PANDORIDÆ.

Shells irregular, inequivalve, compressed, pearly; mantle closed; branchiæ of each side coalescing; siphons separate at tips only.

Genus PANDORA, Brug. 1792.

Shell inequivalve, inequipartite, pearly within; right valve flat, left valve convex; hinge with two diverging teeth in the flat valve and corresponding grooves in the opposite one.

Pandora trilineata.

Shell oblong-ovate, rounded before, and with a recurved beak behind. Along the posterior hinge margin of both valves run two rough, elevated, radiating lines.

Pandora trilineata, SAY, Journ. Acad. Nat. Sc. ii. 261; Amer. Conch. pl. 2. — CONRAD, Amer. Mar. Conch. 49, pl. 11, fig. 1. — LAM., An. sans Vert. vi. 147. — DE KAY, Nat. Hist. New York, 239, pl. 33, fig. 310. — STIMPSON, Shells of New England, 23. — MIGHELS, Catal. Shells of Maine, 8, and Bost. Journ. Nat. Hist.
Pandora nasuta, SOWERBY, Species Conch. figs. 18, 19.

Shell pearly-white, ovate, inequipartite, the anterior part high and regularly rounded, about half the length of the posterior part, which has the hinge margined, flattened, straight or somewhat concave, the edge of the flat valve shutting over the edge of the convex valve, and terminating in a recurved or ascending tip, its points coarsely wrinkled, irregular, and slightly gaping; the anterior portion of the basal margin has a depending or pouch-like appearance; the upper edge is margined by two wrinkled, rounded lines radiating from the beaks, most obvious on the convex valve; surface wrinkled with undulating lines of growth, and with very faint radiating lines on the flat valve; sometimes there is a slightly impressed line passing from the beak to the middle of the base, and in fresh specimens the portion anterior to this line has a sort of mud-colored epidermis as if the shell had been forced into the mud endwise up to this line. Hinge in the left or convex valve with three diverging teeth, the anterior one much the longest and strongest, the middle one very delicate; the third is rather a thickening of the posterior margin, with a ledge in it for the reception of a tooth in the opposite valve. Right or flat valve with two teeth, one short, triangular, strong, directed across the shell, the other long, inclined to the posterior hinge margin. Within iridescent; muscular impressions rounded, connected by a series of about a dozen rough spots for the adhesion of the mantle. Length, one and three tenths inches; height, seven tenths of an inch; breadth, one fifth of an inch, nearly.

Fig. 379.

P. trilineata.

The animal has the mantle closed except for the issue of the slender foot and the siphons; branchiæ continued within the siphon, and coalescing posteriorly; siphons short, purplish, the up-

per one smallest, diverging at their orifices, which are fringed with filaments or soft spicula.

Found about the sandy regions of Cape Cod, and not unfrequently discovered adhering to oysters in the market. Dr. J. W. Mighels of Portland, Maine, has taken it by dredging in Casco Bay. Mr. Say found it as far south as Florida. Boston Harbor in four fathoms; Eastport, five fathoms; Marblehead (*Haskell*); Grand Manan (*Stimpson*); Salem Harbor (*Wheatland*); Nantucket (*Parker*); Vineyard Sound (*Agassiz*); Buzzard's Bay (*Prime* and *Stimpson*); Sable Island (*Willis*).

This is a very curious shell, easily recognized by its pearly substance, its flat valve, and its upward curved tip. From all other species yet described it is distinguished by the two lines bordering its posterior hinge margin. Mr. Say has figured a small young specimen; the rostrated tip is represented as too slender, as is also the whole shell, and the pouch-like appearance of the posterior base is not sufficiently indicated for adult shells. There is often a good deal of contortion and irregularity in the shape of the shell.

Family ANATINIDÆ.

Shell elongated, inequipartite, inequivalve, fragile, somewhat pearly, slightly gaping at one end; hinge with a thickening or spoon-shaped process, to which the ligament is attached, usually supported within by an ossiculum. Animal with the mantle closed, foot slender, branchiæ with a single leaf, siphons long, separate, fringed.

There seems a propriety in separating from the family Myadæ some of the genera formerly included under it. The delicate and pearly fabric of the shell, and the presence of the little irregularly shaped bone resting against the hinge within, are well-marked characters. These shells attain to a considerable size, and live in the sand about low-water mark.

Genus LYONSIA, Turton. 1822.

Shell inequivalve, subtriangular, fragile, pearly; hinge having a narrow ledge within each valve, to which the ligament is attached and against which adheres a four-sided ossiculum.

In the course of the reformations recently made in the indefinite genus *Anatina* of Lamarck, this shell has passed under several generic appellations. A genus was instituted by Leach, to receive the old *Mya Norvegica*, which he called *Magdala*, and, still later, Scacchi has named it *Pandorina*. Perhaps I may be censured for breaking, in this instance, the salutary rule, that the oldest published name should take precedence of all others. The genus *Lyonsia* certainly preceded that of *Osteodesma*, and so, I think, did *Magdala*. But the name *Osteodesma* is so well chosen, and is so well made known in the recent edition of Lamarck's work, being, moreover, the type of the natural family *Octeodesmacea*, that I cannot refrain from giving it the preference. [More mature consideration has induced me to conform to the general consent of conchologists and adopt the older name. *Magdala* was only a manuscript name until 1827.

Lyonsia hyalina.

FIG. 31.

Shell sub-ovate, fragile, pearly, translucent, inequipartite; elongated, compressed, and truncated posteriorly; covered with radiating wrinkles; ossiculum a truncated wedge.

Mya hyalina, CONRAD, Journ. Acad. Nat. Sc. vi. 261, pl. 11, fig. 12.
Lyonsia hyalina, CONRAD, Amer. Marine Conch. 51, pl. 11. fig. 2. — STIMPSON, Shells of New England, 23; Inv. Gr. Manan, 21.
Osteodesma hyalina, COUTHOUY, Bost. Journ. Nat. Hist. ii. 166. — DE KAY, Nat. Hist. New York, 234, pl. 33, figs. 311, A, B. — GOULD, Inv. Mass. 1st ed. 46. — MIGHELS, Bost. Journ. Nat. Hist. iv. 315.

Fig. 330.

L. hyalina.

Shell elongated, sub-ovate, thin, fragile, pearly, translucent, inequipartite, the posterior part much the longer, narrowed, closely compressed at the end, but slightly truncated, so as to gape a little; hinge margin a straight line and compressed; the remaining outline regularly rounded; beaks prominent, inclining forwards; region of the beaks tumid and smooth; a broad marginal portion is covered by a thin membranous epidermis projecting beyond the edge, and wrought into regular wrinkles, radiating from the beaks; these wrinkles are minutely fringed so as to entangle grains of sand, by which the surface is sometimes entirely coated. The hinge consists of a delicate ledge, running from the beak obliquely downward and backward, serving for the attachment of a ligament, which is also attached to the edge of

the wedge-shaped ossiculum lying against that part. Muscular and pallial marks only indicated by a more pearly appearance; they are far within the shell, and the latter has no well-marked sinus. Length, seven tenths of an inch; height, four tenths of an inch; breadth, three tenths of an inch.

Animal with the foot slender and cylindrical, and with a broad, deep groove; branchial siphon with eight long and eight short cirri, anal with a valve as long as the siphon. (*Stimpson.*)

It is found thrown upon the sandy shores of Cape Cod, Chelsea, Lynn, and other similar localities. Its fragile structure is such as to indicate that it could not live elsewhere than in quiet sand. In April, 1836, the beach at Chelsea was strewed with multitudes of very large and mature ones. Since then I have found only an occasional specimen. Whole coast; Grand Manan (*Stimpson*); Marblehead Harbor (*Haskell*); Eastport, common (*Cooper*); St. Anne (*Bell*).

The ossiculum is almost always detached and lost. Sometimes, when the valves are separated, it adheres to one of them, and then it looks like the tooth of a MYA. When destitute of the ossiculum, if reliance were placed upon the hinge alone, the shell would probably be called an AMPHIDESMA, or some undescribed genus. There is no other shell on our coast, however, which presents the radiated wrinkles of the epidermis, together with the pearly lustre of this shell.

The genus LYONSIA now embraces but three or four species. One of these, the *L. Norvegica* of Northern European seas, is very similar to ours. But it is distinct. It grows to a much larger size, is more inequipartite, more broadly truncate; the base is less regularly curved, and is covered by a much stronger and more opaque epidermis.

Young specimens are very thin, and have a horn-colored exterior, and numerous thin, concentric ridges at the different stages of growth.

If the valves are unequal, according to the definition of the genus, the difference must be very slight.

Lyonsia arenosa.

Shell transversely ovate, ventricose, opaque white, beaks anterior, covered with an ash-colored epidermis to which sand becomes attached.

Pandorina arenosa, MÖLLER, Index Moll. Grœnl. (1842).
Lyonsia (*Pandorina*) *arenosa*, MÖRCH, Beskr. af Grönl. 90 (1857).

Anatina striata, Gray, Append. Beechey's Voy. t. 43, fig. 3.
Lyonsia gibbosa, Hancock, Ann. Nat. Hist. xviii. t. 5. figs. 11, 12.

Shell ovate-quadrate, elongate, wedge-shaped, beaks at anterior third, dirty-white, covered with a very thin epidermis, which is raised into numerous fine radiating ridges which entangle particles of sand, &c.; disk tumid; posterior dorsal margin rectilinear; ventral margin nearly parallel to it, gently curving upwards, tip broadly and squarely truncate; dorso-ventral ridge distinct, obtuse, the portion above it compressed; anterior dorsal margin at nearly a right angle with the posterior, direct, joining the ventral margin by a very short turn; anterior area broad and deep, lanceolate; right valve the smaller and most shallow. Interior shining white. Hinge very delicate, the margins each side of the apical point only very slightly thickened. Ossicle like ivory, narrow and elongate, with a nick at one end and a spine at the other, and with a sharp ridge along the middle of the concave face. Length, five tenths of an inch; height, three tenths of an inch; breadth, two tenths of an inch.

Fig. 381.

L. arenosa.

Inhabits Halifax and Fishing Banks (*Willis*); Labrador (*Packard*); Greenland (*Möller*); also fossil in Greenland.

This shell differs from the more common *L. Norvegica* by its short, wedge-shaped, inflated form, dingy exterior, and more finely wrinkled epidermis, and want of brilliant pearly lustre. It is rarely if ever found this side of the British Provinces. Middendorff unites both this and *L. hyalina* with *L. Norvegica*. He could not have seen this species.

Genus ANATINA, Lam. 1809.

Shell sub-equivalve, gaping slightly; hinge with a prostrate, spoon-shaped tooth in each valve to receive the cartilage, and a small ossiculum resting in front of the teeth, usually removed with the animal.

Anatina papyracea.

Fig. 28.

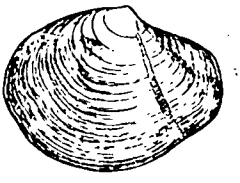
Shell thin, fragile, white, rounded-ovate, inequipartite, the shorter part narrowed and truncated; tooth narrow, directed obliquely forwards.

Anatina papyratia, Say, Journ. Acad. Nat. Sc. ii. 314. — Totten, Silliman's Journal, xxviii. 347, fig. 1.

Anatina papyracea, Gould, Inv. Mass. 1st ed. 47. — Stimpson, Shells of New England, 22. — De Kay, Nat. Hist. New York, 235, pl. 31, fig. 300.

Shell small, broadly rounded-ovate, fragile and thin, white and pearly; the right valve most convex; inequipartite, the posterior or shorter side narrowed, and at the tip clipped, and moderately gaping; margin, from the beak backward, a straight line; the rest of the outline regularly curved with a slight inflection of the posteal ventral margin; beaks placed about one third of the length of the shell from the posterior extremity, moderately prominent, inclining forwards, and cleft across the middle; from the beaks to the lower posterior angle runs an elevated, angular ridge; surface finely marked by the lines of growth, with vestiges of a yellowish white epidermis; interior pearly; tooth long and narrow, slightly concave, directed obliquely across the shell, supported beneath by a short, sharp, elevated rib; muscular and pallial impressions very superficial. Ossiculum somewhat like two crescents joined at the extremities, fitting in front of the teeth. Length, thirteen twentieths of an inch; height, one half of an inch; breadth, one fourth of an inch. A fine specimen taken at Anticosti Island by Dr. Packard was three times as large.

Fig. 382.



A. papyracea.

Found in the stomachs of fishes caught off Nahant; and taken by dredging in Newport Harbor by Colonel Totten. In three fathoms, fine sand, east of Deer Island, and in four fathoms, soft mud, off the Navy Yard; from Cape Ann, southward (*Stimpson*); Eastport (*Cooper*); Sable Island (*Willis*); Anticosti Island (*Packard*).

The animal has the foot long, cylindrical, opaque white, and wrinkled across.

This is undoubtedly the shell described at length by Colonel Totten, and for which he proposes the specific name *fragilis*, provided it be not the *A. papyratia* of Say. Mr. Say's dimensions differ a little in their proportions from the New England shell; but our shells have sufficient latitude of dimensions to render this variation of little importance.

The only shell we have that resembles it is the *Macoma fusca;* but that shell has less thickness, is equilateral, and rounded throughout, besides the great difference of the hinge. It is also very like *Thracia myopsis*, but is well marked by its spoon-like cartilage pits and acute supporting rib.

Genus COCHLODESMA, Couthouy. 1839.

Shell inequivalve, inequilateral, slightly gaping at both ends; beaks small, cloven; hinge a spoon-shaped process in each valve, supported by an oblique rib, and receiving the cartilage.

Cochlodesma Leanum.

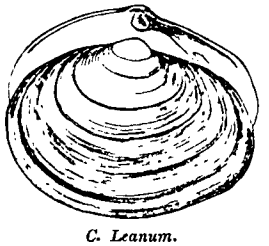
Figs. 29, 30.

Shell thin, white, sub-oval, the shorter side of the right or more convex valve truncated; rib-like support directed backwards.

Anatina Leana, Conrad, Journ. Acad. Nat. Sc. vi. 263, pl. 11, fig. 11.
Cochlodesma Leana, Couthouy, Bost. Journ. Nat. Hist. ii. 170. — De Kay, Nat. Hist. New York, 236, pl. 31, figs. 299, 301. — Chenu, Man. de Conch. ii. 38, figs. 170, 171. — Mighels, Shells of Maine, Bost. Journ. Nat. Hist. iv. 315.
Cochlodesma Leanum, Stimpson, Shells of New England, 22.

Shell sub-oval, thin and brittle, white, with a thin, yellowish epidermis; the right valve convex, and truncated at the shorter end; the left valve nearly flat, and rounded at both ends; posterior end gaping, a little the shorter, and usually a little the narrower; beaks very small, scarcely prominent, cleft at one side; a faint, wave-like ridge passes from them to the lower posterior angle; surface slightly wrinkled by the lines of growth, somewhat pearly beneath; interior chalky-white, the muscular and palleal impressions superficial, pearly. The spoon-shaped hinge process nearly horizontal, directed across the shell, and resting on a rib-like support, directed to the posterior muscular impression, immediately in front of which is another thread-like branch in the direction of the cleft in the beak. Ossiculum none. Length, one and two fifths inches; height, one inch nearly; breadth, nine twentieths of an inch.

Fig. 333.



C. Leanum.

Found about Cape Cod in almost every direction, inhabiting sandy beaches; also about Nantucket. I have never heard of it on the north shore of Massachusetts Bay, but it is more abundant to the south of us. From Casco Bay southward (*Stimpson*); near Portland (*Mighels*); Nahant Beach, after a storm (*Haskell*); Chelsea Beach (*Monds*); Fishing Banks (*Willis*).

The animal has the mantle closed in front, except an opening

for a broad, compressed foot, extending the whole length of the small, abdominal mass; edges of the mantle a little thickened and wrinkled; siphons long, slender, separate in their whole extent.

This genus, proposed by Mr. Couthouy, has, I observe, been admitted by J. E. Gray, in the "Annals of Science," and I have therefore adopted it without hesitation.

This species very closely resembles *Mya* (Cochlodesma) *prætenuis* of Pennant (*Ligula prætenuis*, Montagu), but differs in being more rounded, less convex, less narrowed behind, and has no signs of a granulated or shagreened epidermis, like that shell.

Genus THRACIA, Leach. 1824.

Shell inequivalve, slightly gaping at both ends; beaks conspicuous, one of them perforated; hinge with prominently thickened margins, to which an external ligament is attached.

Thracia Conradi.

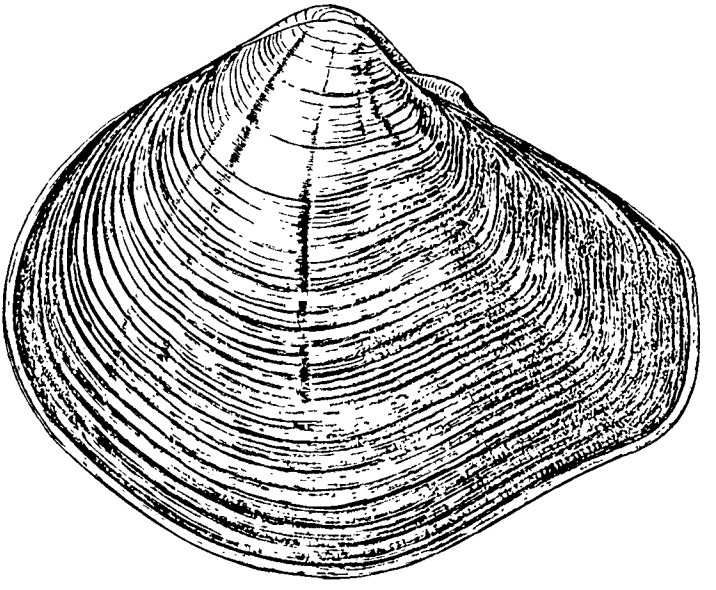
Shell tumid, thin, inequipartite, rounded-ovate, with the smaller extremity truncated, exterior pale ashy-white, beneath which it is pearly.

Thracia declivis, Conrad, Amer. Marine Conch. 44, pl. 9, fig. 2.
Thracia Conradi, Couthouy, Bost. Journ. Nat. Hist. ii. 153, pl. 4, fig. 2. — De Kay, Nat. Hist. New York, 237, pl. 28, fig. 284. — Russell, Essex Journ. Nat. Hist. i. 75. — Mighels, Bost. Journ. Nat. Hist. iv. 315. — Stimpson, Shells of New England, 23; Inv. Gr. Manan, 21. — Reeve, Elem. Conch ii. 154, fig. 130.

Shell ovate, orbicular, rounded before, narrowed and truncated behind, thin, light and fragile, of a dingy white color; beaks nearly central, protuberant, turned a little backwards, that of the right valve perforated to receive the point of the other; the flattened area about the ligament is large and lance-shaped, bounded by a distinct ridge; surface coarsely wrinkled by the lines of growth, undulated by a ridge extending from the beak to the lower posterior angle, and by another broader eminence running from the beak to the middle of the base, causing an outward curve to the margin at that part; the right valve is considerably larger than the left, projecting beyond it, and much more convex. Ligament large, protuberant, and rounded, attached within to strong, thick, rounded eminences, which run backwards from the beaks along the edge. Interior of a chalky white color; pallial impression broad, with a very deep, acute-angular sinus. A thin, brownish

epidermis is found on some portions of the shell. There is no ossiculum. Length, three inches; height, two and one half inches; breadth, one and one half inches.

Fig. 384.



T. Conradi.

Found perfect, and containing the living animal, on Chelsea Beach, after violent easterly storms, and probably lives in the sand not far from low-water mark. Single valves have been found abundantly on Rhode Island, and also on the coast of Maine, and in Buzzard's Bay, so that it probably inhabits the whole New England coast. Nahant Beach (*Haskell*); mouth of Penobscot River (*Walden*); Grand Manan; Eastport, in six fathoms; whole coast (*Stimpson*); Fishing Banks (*Willis*).

This is a large and interesting shell, easily distinguished from most of our shells by its toothless hinge; and when the valves happen to be found united, the disparity in their size and convexity is at once perceived. When the external coating is removed, we come to a silvery substance like mother-of-pearl. I have a specimen, the dimensions of which are, length, four inches; height, three and four tenths inches; breadth, two and one tenth inches. Dr. Prescott of Lynn has one nearly as large.

I have carefully dissected the animal, and find it to correspond in all essential particulars with the anatomy as laid down in Kiener.

Like many others of our shells, this has had the misfortune to have several names applied to it which it cannot claim. It is beautifully and accurately figured by Mr. Conrad, but his synonymy is entirely erroneous. In the "Catalogue of Animals and Plants of Massachusetts, 1834," it is referred to under the name of *Anatina convexa*. In Dr. Storer's Translation of Kiener's "Iconography," &c., it is alluded to under the supposition that it was *T. corbuloides*, to which species it is, indeed, closely allied. But it is more equipartite, more rounded, proportionally narrower behind, and its surface has not the shagreen roughness of that shell.

Mr. Couthouy has fully pointed out its distinctive characters, and established it as a species, and for more minute particulars his article in the Boston Journal may be referred to.

Thracia myopsis.

Shell small, solid, rounded oval, beaks sub-central, broadly truncate behind, ossiculum very minute.

Thracia myopsis, Beck, Möll., Ind. Moll. Grœnl. 18 (1842). — Mörch, Fortegn. over Grönl. Bloddyr in Beskrivelse af Grönl. 90 (1857). — Stimpson, in Sillim. Journ. 1858; Inv. Gr. Manan, 21.
Thracia Couthouyi, Stimpson, New England Shells, 23 (1851); Proc. Bost. Soc. iv. 13.

Shell small, white, orbicular-ovate, compressed; beaks nearly median, narrowed and rounded in front, more pointed and truncate behind, gaping; surface with rather elevated concentric lines; hinge callus thickened backwards, without any distinct spoon-cavity. Ossiculum very minute.

Fig. 385.

*T. myopsis.**

Length, one inch; height, seven tenths of an inch.

Found in Massachusetts Bay and Eastport, Me., in the Coralline zone; Grand Manan (*Stimpson*); Greenland (*Möller*); Labrador (*Packard*).

Animal with the mantle closed; foot large and tongue-shaped; siphons free, long, fringed at aperture; branchiæ unequal, the external comb smallest.

* I am indebted to the kindness of Dr. Stimpson for an opportunity of figuring this species. — W. G. B.

Thracia truncata.

Shell small, rather solid, beaks posterior, broadly truncate behind, hinge-pit elongated.

Thracia truncata, MIGH. and ADAMS, Bost. Journ. Nat. Hist. iv. 38, pl. 4, fig. 1 (1842). —STIMPSON, Shells of New England, 22 (1851); Mar. Invert. Gr. Manan, 21 (1853); Check Lists, Smith. Inst. 3. — MÖRCH, Grönl. Blöddyr, 18 (1857).

Shell small, ovate-triangular, compressed, white, rather solid; beaks at posterior fourth, anterior disk semi-oval, posterior triangular, abruptly truncate at tip, posterior dorsal margin rapidly sloping; a ridge passes from the beaks to the posterior ventral angle; anterior dorsal margin nearly horizontal; surface with numerous and conspicuous lines of growth, and covered by a pale yellowish epidermis; beaks small, that of the right side moderately excavated to receive that of the left. Interior clear white. Ligament rather large and prominent. Hinge callosity not spoon-shaped, produced; pallial sinus deeper than wide.

Fig. 386.

T. truncata.

Length, three fourths of an inch; height, half an inch; breadth, three tenths of an inch.

Inhabits Casco Bay, Maine (*Mighels*); Massachusetts Bay, on the Middle Bank (*Ayres*); off Lynn (*Tufts*); east of Scituate; Casco Bay, off Cheney's Head, Maine (*Stimpson*); off Martha's Vineyard (*Agassiz*); off coast of Long Island, thirty-seven fathoms (*Coast Survey*); Greenland (*Mörch*).

A small species, but its solidity shows it to be mature. It is remarkable for its short posterior half. Nor is any mention made of an ossicle; and the hinge itself hardly allows it to be brought among typical species. Dr. Stimpson has found an ossiculum, very small indeed, in several instances.

FAMILY MACTRADÆ.

SHELL equivalve, usually somewhat gaping at ends; hinge with an internal cartilage, and sometimes an external ligament also. Animal with the mantle open below; siphons united and fringed; gills short.

Genus MACTRA, LAM. 1799.

SHELL elongated, slightly gaping at ends; beaks prominent; hinge a prostrate, concave tooth to contain the cartilage, having

at one margin a delicate, erect tooth like the letter V; two lateral teeth near the central ones. Animal with the mantle open to the siphons, fringed; siphons fringed; foot kneed; outer branchial leaflet shortest.

Mactra solidissima.

Shell large, massive, strong, oval, covered with a dirty-brown epidermis, subequipartite; hinge strong, V tooth delicate; pallial impressions slightly indented posteriorly.

Mactra solidissima, CHEMN., Conch. x. 350, t. 170, fig. 1656 (hinge). — DILLWYN, Catal. i. 140. — WOOD, Index, pl. 6, fig. 22. — CONRAD, Amer. Mar. Conch. 64, pl. 14, fig. 7. — PHILIPPI, Abbild. t. 1, fig. 2. — STIMPSON, Shells of New England, 20; Invert. Gr. Manan, 21. — DE KAY, Nat. Hist. New York, 229, pl. 29, fig. 286.

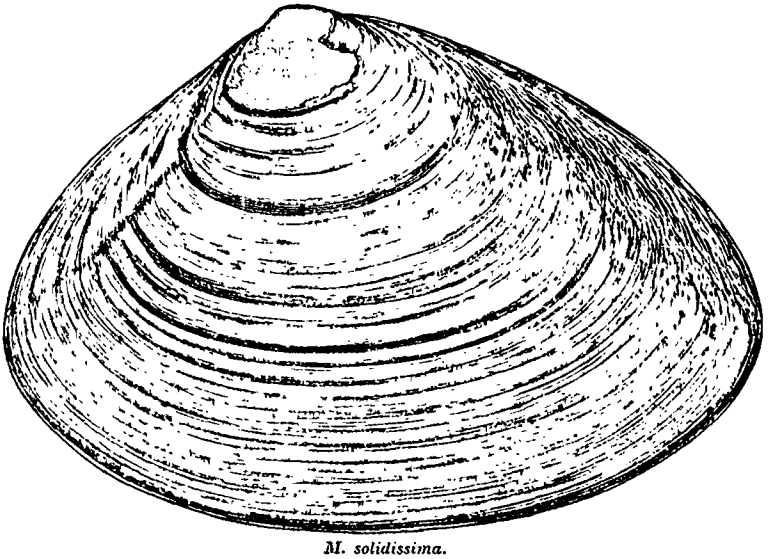
Mactra gigantea, LAM., An. sans Vert. vi. 97. — DESHAYES, Encyc. Méth. Vers, ii. 394, pl. 259, fig. 1 (1830). — CHENU, Ill. Conch. pl. 1, fig. 2; Man. de Conch. ii. 56, fig. 231. — MIGHELS, Bost. Journ. Nat. Hist. iv. 315.

Mactra luteola, LOVÉN, MSS. (young).

Mactra ponderosa, PHILIPPI, Abbild. t. 1, fig. 1 (1844).

Shell very large and solid, transversely ovate, somewhat triangular, nearly equipartite, anteriorly a little the shortest, and with

Fig. 387.



M. solidissima.

a fissure between the beaks; surface slightly folded at the lines of growth, covered with a thin, dirty-brown or straw-colored epider-

mis, which is usually worn from the disk; beaks large and protuberant, inclined a little forwards; behind them is a broad, lanceolate space, bounded by sharp ridges passing from the beaks to the upper part of the basal angle, in which the epidermis is foliaceous, or very loosely wrinkled; a much more faintly developed areola may also be observed before the beaks. Hinge very strong, spoon-shaped cavity very large and broad, the V tooth very delicate, and adhering by a very small base, so that it is usually broken off in the cartilage; lateral teeth long and thin, striated on their receiving surfaces. Muscular and pallial impressions very decided, the posterior sinus of the latter quite shallow. Length, four and one half inches; height, three inches; breadth, one and four fifths inches.

It is found about sandy beaches on all our coast, and its inhabitant is much esteemed by some as an article of food; but it is apt to induce severe pain. At low water it is dug out of the sand with shovels. At higher tides, when the shell is open, the fishermen wade into the water, thrusting a pointed stick into the sand before them, as they walk along. If the stick happens to pass between the valves, they are closed upon it by the animal, and the shell is thus drawn up.

This is sufficiently characterized at maturity by its great magnitude, which entitles it to the name of *giant clam*. On the coast of Long Island it is called *beach clam* and *dipper clam*. About Cape Cod it is called *hen* (an Indian name) clam or *poquau*, in distinction from the common clam which they called *siki*. The term *poquau*, by corruption and plural termination *quahaug*, is now applied to the round clam (*Venus mercenaria*), while the latter term has become obsolete. The Indians used them as hoes to hill corn with. "In some places of the country there be clams as big as a penny white loaf" (*Wood's New England Prospect*). No other species of the genus approaches it in size except the next, from which it may be distinguished at all stages by its striated lateral teeth. The largest specimen I have seen measures six and one fourth inches in length, four inches in height, and two and one half inches in breadth. It preserves its general features through all ages, except that, when young, it is more nearly equipartite, and, after it has attained its full dimensions, it acquires great weight and thickness. Some specimens obtained in Provincetown Harbor, where there are no rocks and little surf, are very light, thin, and white.

A specimen from the cabinet of Colonel Totten, which he found

at Newport, I presume to be the *M. similis* of Say. Whether it be simply a variety of *M. solidissima* or not, I will not presume to decide from this one specimen; and as it is not strictly a Massachusetts shell, I shall merely notice it in this way. The shell has certainly quite a different aspect. It is triangular, the beaks are more elevated, the marginal outlines are straight, and the comparative dimensions vary as follows:—

M. solidissima, length, one and four fifths inches; height, one and three twentieths inches; breadth, three fifths of an inch.

M. similis, length, one and four fifths inches; height one and four tenths inches; breadth, four fifths of an inch.

[No doubt is now entertained of their distinctness.]

M. ponderosa of Philippi I should regard as a form of this species and not of the following.

Dr. Stimpson found in abundance a most extraordinary form, short and ventricose, but with the striated teeth and general characters of the species. Its relative dimensions were, length, three and one eighth inches; height, two and one half inches; breadth, one and one half inches; and these proportions are maintained through the very young specimens. It inhabits Grand Manan, and may be called var. *curta*.

Our species all belong to that subdivision of the old Linnean genus which Dr. Gray calls SPISULA.

I have received a shell, about three fourths of an inch long, from Dr. Lovèn of Stockholm, which he calls *M. luteola*. I cannot perceive that it differs from the young of this shell, of a corresponding size.

Mactra ovalis.

FIG. 32.

Shell large, thick, obovate, coarse, nearly equipartite, covered with a tough, dusky-brown epidermis; V tooth strong; lateral teeth not striated; sinus of pallial impression deep.

Mactra similis, GRAY, Append. to Beechey's Voyage, pl. 44, fig. 8.

Mactra grandis, DESHAYES, Encyc. Méth. Vers, ii. 395, not *M. grandis* of CHEMNITZ and others. — MIGHELS, Journ. Bost. Soc. Nat. Hist. iv. 316.

Mactra ovalis, GOULD, Inv. Mass. 1st ed. 53. — DE KAY, Nat. Hist. New York, 230. — MIDDENDORFF, Siber. Reise (Moll.) 103. — REEVE, Conch. Icon. fig. 36.

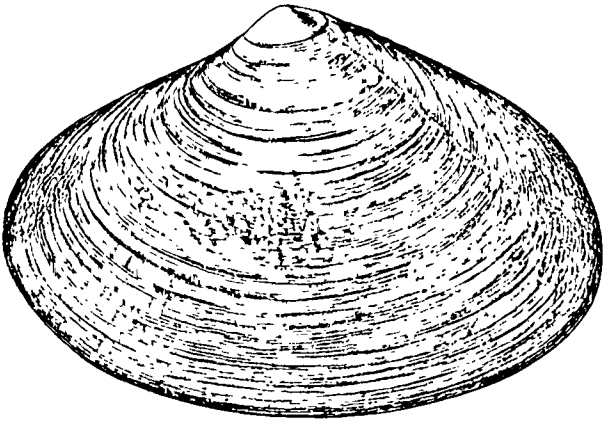
Mactra ponderosa, STIMPSON, Shells of New England, 20.

Mactra polynyma, STIMPSON, Check List, East Coast Shells, 3.

Shell large, thick and coarse, somewhat compressed, sub-oval, a little shortest anterior to the beaks, and, the anterior slope of the

hinge margin being slightly concave, it is there somewhat narrowed; posterior slope convex, extremity slightly gaping, base regularly curved; beaks but little elevated; before, there is a short, faintly defined areola; behind them is another portion bounded by an elevated line extending from the beaks to near the lower angle, and here the epidermis is very coarsely and loosely wrinkled; the surface has a rugged appearance from the coarse lines of growth, and is rendered still more rugged by the folds of the thick, strong, dusky-brown epidermis in the same direction. In-

Fig. 388.



M. ovalis.

terior bluish-white; hinge-supports strong and smoothly rounded; V tooth strong and firm, having the anterior side in the right valve much more elevated than the posterior; lateral teeth short and slender, not striated; muscular and pallial impressions rather superficial; sinus of the latter deep. Length, three and one half inches; height, two and one fourth inches; breadth, one and one fourth inches.

Found at the Bank fisheries, in the stomachs of fish. Eastport and Grand Manan, at low-water mark, large and plentiful; and southward to Cape Cod (*Stimpson*); Sable Island (*Willis*); Gulf of St. Lawrence (*Bell*). The young, from a fourth of an inch to an inch in length, are found abundantly in fish caught in Boston Harbor. At least, they differ from the young of *M. solidissima*, and correspond in external proportions and appearance to our shell, and the teeth are slender and without striæ. Middendorff gives the Sea of Ochotsk, and Wossnessenski gives Behring's Straits as

localities; but I apprehend that *M. falcata*, Gould, is the species referred to.

This shell is inferior in size to the *M. solidissima* only. The largest valve I have seen measures four and one fifth by two and four fifths inches. In general it is found smaller than the dimensions given. Such specimens have a straw-colored epidermis.

Its size, shape, and surface distinguish it from *M. grandis*, Chemn., *M. solida*, and all other known species except *M. solidissima*. Compared with that more common shell, it differs in its coarser surface, its thick, dusky epidermis, its less elevated beaks and less convex valves, the longer and less elevated anterior portions, the rough, oval portion behind the beaks embracing more of the shell, the more feeble hinge, the stout and firm V tooth, and the deep sinus of the pallial impression.

I have very little doubt that this is the shell described by Deshayes as *M. grandis*. The description corresponds well. But, as it is not figured or quoted by other authors, and the habitat was not known to him, it is impossible to decide with certainty. Singularly enough too, Deshayes himself does not cite it in his new edition of Lamarck. Provided it be the same, however, the specific name must necessarily be changed, as his name was previously given to a different species by Chemnitz.

This appears to be the same species, a small specimen of which is figured by Mr. Gray in the Appendix to Beechey's Voyage, under the name of *M. similis*. This name is preoccupied by Mr. Say.

It is objected that the name *ovalis* has been used for a fossil species; but if the generic term *Spisula* be adopted, this shell will retain the above name. As before observed, Philippi's *ponderosa* appears to me to represent a variety of *M. solidissima*, rather than this species.

Mactra lateralis.

FIGS. 34, 35.

Shell small, triangular, very convex, nearly equipartite; beaks elevated, the spaces before and behind them broad heart-shaped.

Mactra lateralis, SAY, Journ. Ac. Nat. Sc. ii. 309. — CONRAD, Amer. Mar. Conch. 62, pl. 14, fig. 4. — DE KAY, Nat. Hist. New York, 230, pl. 29, fig. 287. — PHILIPPI, Abbild. pl. 1, fig. 3.

Shell small, triangular, tumid, nearly smooth, shining; nearly equipartite, the posterior part somewhat prolonged, and sloping

less rapidly than the anterior part; ends rounded; beaks elevated, not meeting, pointed, and inclined forwards; the regions before and behind the beaks are broad, flattened, and more or less heart-shaped, defined by slightly elevated ridges; surface finely marked by the lines of growth, white, covered with a thin, dirty-brown epidermis; hinge strong, the pit for the cartilage being a small recess penetrating deeply into the beaks; before it is a strong, prominent V tooth, and on each side of it, in the left valve, is a stout and prominent lateral tooth, and in the other a deep fossa with elevated sides to receive it; cavity of the beaks deep; muscular impressions deep; pallial impressions distinct, with a shallow sinus posteriorly; interior clear glossy-white. Length, half an inch; height, seven twentieths of an inch; breadth, three tenths of an inch.

Fig. 389.

M. lateralis.

The siphons of the animal are yellow, long, and slender, the upper one with a short valve, and bluish above; the lower one fringed.

The only places where I have found this shell living are the inlets of the salt marshes between Roxbury and Boston. But all the flats which have been drained by the erection of the Milldam have a layer of them just beneath the surface; and vast numbers were unearthed in throwing up the embankments for the railways which cross them. They doubtless exist plentifully in the full basin on the other side of the Milldam. They are found abundantly at New Bedford also, and I know them to be common about Rhode Island. Plentiful in coves near Lynn; Charles River at Brighton Bridge. Near Charleston, S. C., it is plentiful in sandy mud flats.

It assumes very various forms, depending mostly on age. When young, the shell is thin, rather compressed, and the beaks are inconspicuous and touching each other. By age it becomes very thick and turgid, the beaks elevated and widely separated, and the height of the shell often equals its length.

The small, deeply penetrating pit of the hinge is very peculiar.

The dimensions of one from the track of the Providence Railroad is as follows: length, nine tenths of an inch; height, eight tenths of an inch; breadth, six tenths of an inch. It is represented at Figure 34 of the first edition.

It is not likely to be mistaken for any other species. The young

of *M. solidissima* and *M. ovalis* are much less triangular, and of a very different aspect. It has more the proportions of *M. solida* of Europe.

Genus CUMINGIA, Broderip and Sowerby. 1833.

Shell ovate, inequipartite, equivalve; a shallow, spoon-shaped cardinal tooth, and a single small tooth by its side in each valve, and a strong lateral tooth on both sides in one valve only; pallial impression with a large sinus.

Cumingia tellinoides.

Fig. 36.

Shell ovate-triangular, thin, white, nearly equipartite, pointed and warped behind; surface with sharp, elevated lines of growth.

Mactra tellinoides, Conrad, Journ. Ac. Nat. Sc. vi. 258, pl. 9, figs. 2, 3; Amer. Mar. Conch. 60, pl. 14, fig. 2. — Russell, Essex Journ. Nat. Hist. i. 53. — De Kay, Nat. Hist. New York, 233.

Cumingia tellinoides, Conrad, Journ. Ac. Nat. Sc. vii. 234. — Gould, Inv. 1st ed., fig. 36. — Stimpson, Shells of New England, 20.

Shell elongated, triangular-ovate, thin, fragile, bluish-white; nearly equipartite, anteriorly broad, tumid, and regularly rounded; posteriorly compressed, warped, ending in a rounded point, the margin declining more rapidly than in front; beaks raised, not inclining to either end. Stages of growth marked by sharp, raised ridges, which are crossed by microscopic, radiating lines; in front of the beaks is a small, well-defined areola. Within, glossy-white; pit for the cartilage shallow, directed slightly backwards; in front of it, in each valve, is a linear tooth forming part of its wall, and at its side a fossa for receiving the corresponding tooth; lateral teeth distinct in the right valve, but wanting in the left, the anterior one longest. Muscular impressions faint, pallial impression far within the shell, with a broad, deep indentation opposite the base. Length, three fifths of an inch; height, nine twentieths of an inch; width, one fifth of an inch.

Fig. 390.

C. tellinoides.

Found abundantly in the region of New Bedford, Martha's Vineyard, and probably may be found everywhere south of Cape Cod.

Its warped, slightly folded end gives it the aspect of a *Tellina*. Its shape and surface are similar to those of *Corbula contracta* of

the same size. The raised lines are, however, thin, elevated, sharp in this, while in *C. contracta* they are thick and rounded, and the shell is so much more compressed as to preclude mistake.

A species of this genus is found in the West Indies, perhaps the same, and one or two more have been found in the Pacific; and these are all the species at present known.

From an examination of the animal, Dr. Stimpson has transferred this genus to the family *Tellinidæ*. The siphons are quite separate, and the warped posterior part would justify this change.

Genus CERONIA, Gray. 1849.

Shell oval, wedge-shaped, truncated posteriorly; lateral teeth sub-equal, compressed, furrowed. Siphonal sinus distinct.

Ceronia arctata.

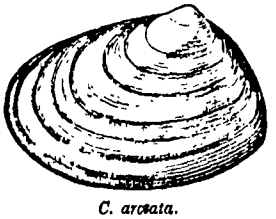
Fig. 39.

Shell sub-triangular, very inequilateral, truncated posteriorly, smooth and covered by a shining yellow epidermis; lateral teeth straight, striated.

Mactra arctata, Conrad, Journ. Ac. Nat. Sc. vi. 257, pl. 11, fig. 1 (1830).
Mactra deaurata, Conrad, Amer. Mar. Conch. 59, pl. 14, fig. 1.
Mactra subtriangulata, Wood, Index, Suppl. pl. 1, fig. 10. — Griffith's, Cuv. (Mollusca) pl. 22, fig. 4.
Mesodesma arctata, Gould, Invert. 1st ed. 57. — Stimpson, Shells of New England, 20. — De Kay, New York Moll. 231, pl. 23, fig. 288.
Ceronia arctata, Chenu, Man. de Conch. ii. 79, fig. 340.

Shell sub-triangular, wedge-shaped, thick and strong, very inequipartite, the posterior part very short, forming the base of the wedge, its lower point truncated; upper margin straight; anterior part narrowed, regularly rounded, as is also the ventral margin; beaks very slightly elevated, erect; a sharp ridge passes from them to the hinder and lower angle; surface with occasional rounded ridges at the stages of growth, covered with a thin, golden-yellow epidermis reflecting a metallic lustre; hinge composed of a very deep, spoon-shaped cavity for the cartilage; a long V tooth opening at a very acute angle, and on each side a straight lateral tooth, partially double in the right valve, their articulating surfaces striated; posterior tooth

Fig. 391.



C. arctata.

much the shorter; muscular impressions well defined, connected by the simple pallial impression with a small posterior sinus of about the size of the rounded, muscular impression at its side. Length, one and one half inches; height, one inch; breadth, eleven twentieths of an inch. I have seen a specimen from Anticosti Island measuring two and one fourth inches in length, and one and five eighths inches in height.

Found abundantly at Plumb Island below Newburyport, and on Nahant Beach; vast numbers are also thrown up on the outer side of Cape Cod; at Nantucket it is rare. At Sable Island (*Willis*), and all along the southeast shore of the St. Lawrence River; sometimes found fossil in its banks at a height of fifteen to fifty feet (*Bell*).

There is no longer any question as to the specific value of this shell; the *deaurata* of Turton being the same as since described as *M. Jauresii*.

Ceronia deaurata.

Fig. 38.

Shell ovate, triangular, thick, antiquated, coarsely ridged concentrically, inequipartite, lateral teeth very strong, curved, faintly striated.

Mactra deaurata, Turton, Dithyra Brit. 71, pl. 5, fig. 8 (1830). — Fleming, Brit. An. 427.

Mactra denticulata, Gray in Wood's Ind. Test. Suppl. pl. 1, fig. 9.

Mesodesma denticulata, Gray, Cuv. An. Kingd. (Griff. ed.) pl. 22, fig. 2.

Mesodesma Jauresii, De Joannis, Mag. de Zoöl. Moll. 1834, pl. 54. — Gould, Invert. 1st ed. 58. — De Kay, Moll. of New York, 231. — T. Müller, Synops. Test. Viv. 221.

Mesodesma deauratum, Hanley, Recent Shells, 39, Suppl. pl. 1, fig. 9. — Forbes and Hanl. Brit. Moll. i. 346.

Ceronia Jauresii, Chenu, Man. de Conch. ii. 79, fig. 342. — Adams, Genera, ii. 414, pl. 106, figs. 3, 3*a*.

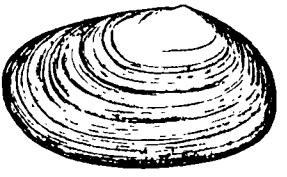
Paphia deaurata, Gray, Br. Mus. Coll. (Br. Moll.) 157 (1851).

Erycina denticulata, Gray, Ann. Philos. 1825; Griffith's Cuv. t. 22, fig. 2.

Shell ovate, triangular, thick and massive, surface rising into ridges at the stages of growth, and covered by a coarse, dusky-brown epidermis; very inequipartite, behind short and regularly rounded to the base where there is an abrupt turn, and the basal margin continues in nearly a straight line, or is a little arched; hinge margin also a straight line or slightly concave, anteriorly regularly rounded; beaks scarcely rising at all, not inclined forwards; greatest width of shell midway between the beaks and

anterior extremity. Spoon-shaped cavity for the cartilage very deep; on its anterior edge is the vestige of a short, widely diverging V tooth, which will seldom be found, as it is scarcely possible to open the valves without destroying it. On each side is a very strong, curved lateral tooth, with a pit above it for the reception of the tooth of the opposite side; the anterior tooth much longer than the posterior, and supported beneath by a thickening of the shell; striæ on the teeth very faint. Within glossy-white; muscular impressions profound, united by a simple pallial line which has a small semicircular sinus behind. Length, one and three fourths inches; height, one and one twentieth inches; breadth, seven tenths of an inch.

Fig. 392.



C. deaurata.

Brought from Nova Scotia (*Willis*) and from Grand and George's Banks. I am not aware that it has actually been found in the waters of this State.

The distinctive marks in comparison with *C. arctata* are its coarse, rough exterior, its longer and uncut posterior side; its very peculiar outline when viewed from above, on account of its breadth anteriorly; and its strong, curved, nearly smooth lateral teeth. Mr. Hanley has decided that the shell described by Turton under this name was not a British shell, but was introduced from America, and is identical with the shell since described as *C. Jauresii*.

Family KELLIADÆ.

Shells minute, equivalve, hinge very variable, pallial impression without sinus; animal with only one siphonal opening (anal); mantle anteriorly folded into a tube; foot grooved; branchial leaflets separate.

Genus **KELLIA**, Turton. 1822.

Shell somewhat globular, equivalve, closed; hinge with two approximate teeth and a remote lateral tooth in one valve, and a concave tooth and a remote lateral one in the other; pallial scar entire. Animal with closed mantle, with a single elongated siphon and lanceolate foot.

Kellia planulata.

FIG. 33.

Shell sub-oval, white, with a thin purplish epidermis; beaks prominent.

Kellia rubra, GOULD, Invert. of Mass. 1st ed. 60 (non auct.).
Kellia planulata, STIMPSON, Shells of New England, 17.

Shell minute, rather thick, sub-oval, very inequipartite, rather compressed; beaks rather prominent and in contact, having before them a deeply excavated, elongated, smooth areola; ends broadly rounded, especially the posterior tip; basal margin scarcely curved and nearly parallel with the superior margin; surface marked with the lines of growth, eroded at the beaks, and covered with a purplish or dirty-brown, rather thick, epidermis. Within white and glossy; two muscular impressions, and the pallial line directly connecting them, without any sinus, quite perceptible. Hinge consists, in the right valve, of a narrow, erect, central tooth, and an imperfect one each side, slightly detached from the edge of the valve; in the left valve, of a well-defined tooth on each side, barely separated from the edge of the valve, leaving a triangular vacancy between them to receive the central tooth of the opposite valve. Length, one sixth of an inch; height, one eighth of an inch; breadth, one sixteenth of an inch.

Fig. 393.

K. planulata.

Several specimens of this minute shell were found by Mr. C. F. Shiverick in the harbor of New Bedford. I have also found it about the roots of sea-weed, which seems to be its proper situation. Buzzard's Bay in three fathoms gravel (*Prime* and *Stimpson*); Boston Harbor in five fathoms, shelly bottom (*Stimpson*); Sable Island (*Willis*); Gull Island (*Smith*).

Dr. Stimpson, by actual comparison with European specimens, has decided this to be distinct from *K. rubra*, where I formerly placed it. It is more compressed in form, and the beaks are less conspicuous.

Kellia suborbicularis.

Shell rounded quadrate, white, inflated, fragile, translucent; two teeth in one of the valves.

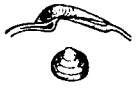
Mya suborbicularis, MONT. Test. Brit. 39, 564, pl. 26, fig. 6; Linn. Trans. viii. 41.—DILLW. Recent Shells, i. 55.
Tellina suborbicularis, TURT. Conch Dict. 179.
Petricola suborbicularis, GRAY, Ann. Philos. 1825.

Tellimya suborbicularis, Brown, Illustr. Conch. Gr. Brit. 106, pl. 42, figs. 14, 15.
Erycina suborbicularis, Recluz, Revue Zool. 1844.
Kellia suborbicularis, Turt. Dithy. Brit. 56, pl. 11, figs. 5, 6. — Flem. Brit. An. 430. — Macgilliv. Moll. Aberd. 276; Brit. Mar. Conch. 51. — Alder, Cat. Northumb. and Durh. Moll. 93. — Wood, Index Testaceol. pl. 3, fig. 37. — Hanley, Recent Shells, i. 43, pl. 3, fig. 37. — Forbes and Hanl., Brit. Moll. ii. 87, pl. 18, figs. 9, 9 *a*, 9 *b*, and pl. O, fig. 4 (animal). — Chenu, Man. de Conch. ii. 125, fig. 598. — Woodward, Man. of Moll. 294. — Adams, Genera, ii. 475, pl. 114, figs. 8, 8 *a*, 8 *b*, 8 *c*. — Lovèn, Ind. Moll. Scand. 44. — Carpenter, Catal. of Mazatl. Moll. 105. — Gray, Coll. Br. Mus. (Br. Moll.) 83.

Animal with a front opening in the mantle, where it is produced into a large, thin, simple tube a little below this, for the passage of a slender grooved foot, and behind for a single short siphon seldom protruded.

Shell very variable in form, from quadrangular with rounded corners, to rounded or ovate-triangular, swelled, thin and fragile, white with a very thin, somewhat iridescent epidermis; beaks nearly median, small, pointed, inclining inwards rather than forwards; no lunule; margins nearly parallel, squared behind, with the angles rounded, anterior dorsal margin a little declining, so that the anterior portion is less elevated and more rounded than the posterior, though often squarish at the upper angle. Within white and shining. Hinge with an elongated triangular plate behind the ligament, with an erect tooth under the apex in the right valve, and two in the left valve, the more central one the larger, erect or recurved, separated from the other by a triangular space caused by its greater inclination forwards, though united at base. Length, about one third of an inch (though sometimes approaching half an inch); height, nearly as great as length; breadth, one fourth of an inch.

Fig. 394.



K. suborbicularis.

Habitat a little uncertain, but two separate lots were found among Massachusetts and Halifax shells. It is common in the English waters and in Norway, where it is found in crevices of old shells and rocks, and among the roots of sea-weed.

The specimens were very carefully compared with European specimens, and no doubt is left as to their identity. The resemblance in form and size to *Sphærium elegans* is quite remarkable, and it may be pretty readily recognized by its squared and symmetrical form.

Genus TURTONIA, Alder. 1849.

Shell minute, equivalve, very inequipartite, closed at both ends; ligament external; hinge with two adjacent teeth in front, the an-

terior one laminar; pallial sinus simple. Animal with the mantle widely open anteriorly, a single very slender siphonal tube at the shorter end, and an ample, angulated foot proceeding from the longer end.

Turtonia minuta.

Shell with the beaks near the anterior end, elongated-oval, compressed, umbones deep purple, becoming pale at margin.

Venus minuta, O. Fabr. Faun. Gr. 412.
Mya purpurea, Mont. Test. Br. Suppl. 21. — Turt. Conch. Dict. 102. — Wood, Gen. Conch. 100. — Dillw. Recent Shells, i. 46.
Montacuta? purpurea, Hanl. Br. Mar. Conch. 25, fig. 14.
Erycina purpurea, Recluz, Revue Zool. 1844, 329.
Lasæa minuta, Möller, Ind. Moll. Grœnl. 20.
Saxicava purpurea, Brown, Ill. Conch. Gr. Br. 103.
Cyamium? minutum, Lovèn, Ind. Moll. Scandin. 42.
Turtonia minuta, Alder, Cat. Northumb. Moll. 95. — Forbes and Hanl. Br. Moll. ii. 81, pl. 18, figs. 7, 7 A, and pl. O, fig. 1 (animal). — Stimpson, Shells of New England, 16. — Möller, Moll. Grœnl. 19.

Shell very minute, ovate, rather convex, fragile, semi-transparent, beaks at about the anterior third, elevated, inclined forwards, smooth, and somewhat shining; straw-colored, blending into dark purple at the beaks and posterior slope; depressed in front of the beaks so that the anterior portion is less elevated than the posterior, then passing round in a regular elliptical sweep into the ventral margin, which is very gently curved; posterior dorsal margin very nearly straight, towards the end sweeping somewhat more rapidly than the ventral margin, so that the end is sharper than the front end, and the point below the median line. The anterior dorsal margin dilates a little so as to form a triangular jutting just under the beak, and there sometimes appears a more minute one by the side of it; and there appears to be a very minute furrow along the posterior edge, not seen without a powerful magnifier. Colors of the interior like those of exterior; pallial line without a notch. Length, about one twelfth of an inch; height, one fifteenth of an inch; breadth, one twentieth of an inch.

Fig. 395.

T. minuta.

Found in crevices of shells and rocks, and among the roots of sea-weeds.

This little shell, so difficult to analyze, is recognized without much difficulty by its color, which is similar to that of *Kellia planulata*, but the shell is longer and more compressed. Like other shells which adhere to floating objects, it is found in widely remote localities. It is found everywhere in North Atlantic waters.

Genus MONTACUTA, Turton. 1819.

Shell ovate or oblong, equivalve, inequilateral, nearly closed; hinge with two teeth in each valve, and a cavity between them; lateral teeth none.

Montacuta elevata.

Shell ovate, triangular, beaks tumid, elevated, nearly central, disk flattened below the middle; tooth on the shorter side oblique, and excavated for the reception of the ligament.

Montacuta bidentata, Gould, Inv. Mass. 1st ed. 59 (non auct.).
Montacuta elevata, Stimpson, Shells of New England, 16 (1851).

Shell minute, fragile, white within and without, or with a very thin straw-colored epidermis, ovate-triangular; beaks nearly central, nearest the broader end, acute and prominent, inclined inwards and slightly forwards; upper margins sloping rapidly from the beaks in a gentle curve; both ends obtusely rounded; surface shining, but rendered somewhat scabrous or rough by numerous loosely cohering edges of the stages of growth; its only variation in color consisting in the opacity or transparency of its substance; very tumid, but the disk is compressed below so as to make the shell more or less wedge-like. Within polished, destitute of any apparent muscular or pallial impressions, except in very old specimens, but faintly marked with radiating lines. Hinge consisting of two teeth, diverging from the beaks, so as to leave a triangular vacancy between them; one of them considerably elevated, and more so in one valve than in the other; that on the shorter slope scarcely rises at its tip above the edge of the valve, and its inner surface is excavated, and receives the ligament. Length, nearly one fifth of an inch; height, one sixth of an inch; breadth, one tenth of an inch.

Fig. 396.

M. elevata.

Found by Mr. C. F. Shiverick in New Bedford Harbor; King's Beach, Swampscott (*Haskell*); Chelsea Beach, thrown up alive (*Stimpson*).

Family GASTROCHÆNIDÆ.

Shell equivalve, generally gaping, hinge very simple, often enclosed in a tube; animal club-shaped, siphons very long, united to near tips; mantle closed, except for a worm-like foot; generally borers.

Genus SAXICAVA, Fleurian de Bellevue. (1802.)

Shell elongate, irregular, inequipartite, slightly gaping at each end. Hinge generally toothless or with only a rudimentary tooth in each valve; beaks small; ligament external, long, strong; pallial sinus narrow and deep.

Saxicava rugosa.

Shell multiform, generally oblong, rounded before and truncate behind, with a prominent ridge from the beaks to the lower posterior angle; surface rough.

Mytilus rugosus, Penn. Br. Zool. iv. 110, pl. 63. fig. 72. — Montagu, Test. Brit. 42. pl. 1. fig. 1. — Donov. Br. Shells, iv. 141, fig. 141; Linn. Trans. viii. 105; Dorset Catal. 39. pl. 13, fig. 5. — Turt. Conch. Dict. 113. — Dillw. Recent Shells, i. 304. — Wood, Ind. Test. pl. 12, fig. 9.

Saxicava rugosa, Lam. An. sans Vert. 2d ed. vi. 152; Spec. of Shells, Engl. ed. 50. — Turt. Dyth. Brit. 20, pl. 2, fig. 10. — Brown, Ill. Conch. Gr. Brit. 103, pl. 47, figs. 14, 16. — Crouch, Introd. Conch. pl. 5, fig. 3. — Sowerby, Gen. (*Saxicava*) figs. 2, 3, 4. — Reeve, Conch. Icon. i. pl. 50, figs. 2, 3, 4. — Woodward, Man. of Moll. 320, pl. 22, fig. 13. — Hanley, Recent Shells, Suppl. 50. — Forbes and Hanl. Hist. Brit. Moll. i. 146, pl. 6, figs. 7, 8, pl. F, fig. 6 (animal). — Chenu, Man. de Conch. ii. 25, fig. 111. — Adams, Gen. 349, pl. 94, figs. 1, 1 *a*, 1 *b* (animal). — Stimpson, Mar. Inv. Gr. Manan, 22; Shells of New England, 25.

Hiatella rugosa, Flem. Br. Anim. 461; Brit. Mar. Conch. 58.

Mytilus pholadis, Müller, Zool. Dan. pl. 87, figs. 1, 2, 3.

Saxicava pholadis, Lam. An. sans Vert. 2d ed. vi. 152. — Turt. Dyth. Brit. 21, pl. 2, fig. 11. — Hanl. Recent Shells, 50. — Guérin, Mag. de Zool. 1841, pl. 40.

Saxicave ridée, Chenu, Trait. Elem. 58, figs. 197, 198.

Byssomya pholadis, Bowditch, Bivalves, fig. 43. — De Blainv. Man. 572, pl. 80, figs. 5, 5 *a*.

Mya byssifera, O. Fabr. Fauna Grœnl. 408.

Saxicava distorta, Say, Journ. Ac. Nat. Sc. ii. 318 (1822). — Gould, Inv. Mass. 1st ed. 62. — De Kay, Nat. Hist. New York, 227, pl. 33, figs. 309 *a*, 309 *b*.

Animal with the mantle lobes united in front; siphons large, united nearly to their ends, which are fringed, the anal opening furnished with a transparent tubular valve; opening for the foot small; foot finger-like, with a byssal groove; gills narrow, unequal, prolonged into the siphon.

Shell oblong-oval, coarse, white, very irregular in shape; inequivalve, the right valve projecting over the left except at the shorter end; inequilateral, the anterior side rounded and generally of about one half the length of the other side, but the beaks are sometimes nearly terminal; the posterior end is most frequently truncated, but at other times rounded; gaping; beaks rather prominent, from

which two ridges or elevated lines run backwards, one near the margin, and the other to the lower angle, giving the included surface a lozenge shape. In some shells these lines are very distinct, and they are armed with a series of elevated, arched scales or spines; the basal margin is usually contracted at the middle, and slightly arched upwards; surface coarsely marked with the lines of growth, and irregularly undulated; epidermis thin, dingy-yellow. Ligament aided by the mantle, which adheres all along the back. Teeth for the most part wanting; when not wanting, a single rudimentary tooth in one valve is received into a pit in the opposite valve; muscular impressions obscure. Length, one inch; height, three fifths of an inch; breadth, two fifths of an inch.

Found adhering to marine objects. They may almost always be found among the roots of fuci, which are thrown up by storms, adhering to stones, shells, &c. The best I have ever obtained were taken from a log drawn out of one of our timber docks, to which they were adhering by a silken byssus issuing from the middle of the base.

The foot of the animal is of a bright orange-color.

This shell is a perfect Proteus, of which no description can be given that is not liable to mislead. I think there can be little doubt that the same shell exists on the European shores, and that it has been already described under at least one name. But, as I have not the means of arriving at certainty on this point, I have chosen, until better satisfied, and as it will introduce no new name, to retain that which Mr. Say applied to it. [Changed in the present edition.

In the first place it would come under the genus *Byssomya*, on account of its being furnished with a byssus. But a majority of the best modern conchologists regard this circumstance as of little importance, and consequently reject the genus. Some specimens correspond well with the description of *S. pholadis*, Lam., the *Mya byssifera*, Fabr. These are found in places where their regular growth is unobstructed. Other specimens, and especially adult ones, seem not to vary from *S. rugosa*. Nothing could apply better to our shell than Turton's description of *Mytilus rugosus*, in his "Conchological Dictionary." But our shell is less likely to belong to this than to *S. pholadis*, inasmuch as, besides the presence of a byssus, our shell is not a borer like *S. rugosa;* indeed, there are no rocks on our coast of a calcareous nature.

Again, there are small specimens in which the two lines or ridges along the posterior slope, armed with spines, are very conspicuous,

corresponding to the *S. rhomboides* of Deshayes, the *Mytilus præcisus* of Montagu, and doubtless the *Hiatella arctica* of Lamarck (*Solen minutus*, Lin.).

Now all these varieties are found living promiscuously together, and, as their shape is known to be greatly modified by the circumstances under which they are developed, the rational conclusion is, that they all pertain to the same species; and the probability is, that they are identical with the European shell; but under what name to place them, and whether under one or more, it is now impossible to say.

[It is now quite possible to say that the shell of the American Atlantic coast is identical with that of the European and Arctic shores. It is so multiform that Woodward states that five genera and fifteen species have been manufactured out of varieties and conditions of this protean species. Two species are generally admitted which, in their early stages at least, greatly resemble each other in the two spinous ridges along the posterior dorsal margin. But they are said to have a constant difference in the anterior end, and in the presence or absence of an areolar space in front of the beaks. We give a pretty extended synonymy of the two, according to latest authorities.

Saxicava arctica.

Shell oblong, beaks at anterior fourth, rostrate in front, with a distinct areolar space in front of the beaks; diagonal ridge spinous.

Mya arctica, Lin. Syst. Nat. 1113. — O. Fabr. F. Grœnl. 407. — Turton, Conch. Dict. 104. — Wood, Gen. Conch. 95.

Solen minutus, Lin. Syst. Nat. 1115. — Mont. Test. Br. 53, pl. 1, fig. 4. — Turt. Conch. Dict. 161. — Chemn. Conch. Cab. vi. 67, pl. 6, figs. 51, 52. — Wood, Gen. Conch. 139, pl. 34, figs. 5, 6. — Dillw. Recent Shells, i. 69. — Lam. An. sans Vert. 2d ed. vi. 57. — Wood, Index Test. pl. 3, fig. 33.

Mytilus præcisus, Mont. Test. Brit. 165; Linn. Trans. viii. 112. — Dillw. Recent Shells, 305.

Hiatella arctica, Lam. An. sans Vert. 2d ed. vi. 443 — Flem. Br. Anim. 461; Br. Mar. Conch. 59. — Crouch, Introd. pl. 8, fig. 6. — Hanley, Recent Shells, 150. — Cuv. R. Anim. pl. 110, fig. 1.

Anatina arctica, Turt. Dyth. Brit. 49, pl. 4, figs. 7, 8; Br. Mar. Conch. 42.

Agina purpurea, Turt. Dyth. Brit. 54, pl. 4, fig. 9; Br. Mar. Conch. 60.

Solen purpureus, Flem. Brit. Anim. 459.

Saxicava purpurea, Brown, Ill. Conch. Brit. 103, pl. 42, figs. 30, 31.

Saxicava rubra, Desh. Exped. Alger. Moll. pl. 66, figs. 18, 19 (shell and animal).

Saxicava rhomboides, Desh. in Lam. An. sans Vert. 2d ed. vi. 153.

Saxicava arctica, Desh. Elem. Conch. pl. 12, figs. 8, 9. — Phil. Moll. Sicil. i. 20, pl. 3, fig. 3, ii. 19. — Macgilliv. Moll. Aberd. 285. — Lovèn, Ind. Moll. Suec. 40. — Chenu, Man. de Conch. 25, fig. 113.

Hiatella minuta, TURT. Dyth. Brit. 24, pl. 2, fig. 12. — BROWN, Ill. Conch. Brit. 103, pl. 47, figs. 1, 16.

Rhomboides arctica, DE BLAINV. Man. pl. 80, figs. 6, 6 *a*, 6 *b*, 6 *c*.

Like *S. rugosa*, this shell is liable to infinite variations from age and place, being obliged to conform in a measure to objects around it. Amid so many varieties on both sides it is hard to separate the species, and indeed it is not fully agreed that they do not blend into one species. After much observation, Forbes and Hanley declare that "the tangible mark of distinction between *arctica* and *rugosa* consists in the presence, in the former, of an excavated lunule in front of the beaks, which are moreover acute, leaning forward, and, when viewed in front, sufficiently prominent. The anterior extremity is more or less cuneiform, and is always attenuated; whereas in *rugosa* that portion is usually rounded and frequently broad; in that shell, likewise, the downward inclination of the front dorsal margin is almost invariably arcuated or convex, whilst in the present species it is oblique, and for a considerable distance incurved, only becoming convex near its ventral termination, which consequently is its most projecting part; the chief prominence in *rugosa* being, on the contrary, usually situated nearer the dorsal side."

Fig. 397.

S. arctica.
Var. *rugosa.*

Genus PETRICOLA, LAM. (1801.)

SHELL elongated, inequipartite, rounded before, narrowed backwards; hinge almost toothless; ligament exterior.

Petricola pholadiformis.

Shell ovate-cylindrical, chalky white, very inequipartite, acutely rounded before, covered with elevated radiating lines and ribs; an ovate areola before the beaks; teeth two in each valve, one in the left valve deeply cleft.

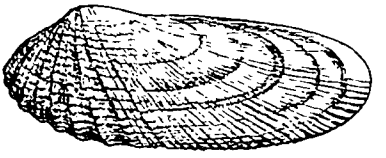
Petricola pholadiformis, LAM. An. sans Vert. 2d ed. vi. 159. — DESHAYES, Encyc. Méth. Vers, iii. 747. — SOWERBY, Genera (*Petricola*), figs. 1, 2; Thes. Conch. pl. 166, fig. 1. — SAY, Amer. Conch. pl. 60, fig. 1 (1834). — CONRAD, Amer. Mar. Conch. pl. 7. — CHENU, Man. de Conch. ii. 100, figs. 446, 447. — REEVE, Elem. Conch. ii. 135, fig. 212. — DE KAY, Nat. Hist. New York, 228, pl. 28, fig. 282.

Petricola fornicata, SAY, Journ. Ac. Nat. Sc. ii. 319 (1822). — RUSSELL, Essex Co. Soc. Journ. i. 55.

Shell much elongated, ovate-cylindrical, chalky-white within and without; equivalve, very inequipartite, the anterior part very short and acutely rounded; posteriorly very little narrowed, the hinge

and basal margins nearly parallel, and the extremity bluntly rounded and a little gaping; beaks elevated and inclined forwards; in front of them is a sharply ovate lunule, distinctly defined, and marked only by the lines of growth; behind them is a projecting ligament of considerable length; surface coarsely marked by the stages of growth, and covered with elevated, radiating lines, various in size and distance; at the posterior hinge margin they are crowded and very faint, while anteriorly they are large and distant; about seven or eight of them are more prominent than the rest, and the lines of growth rise upon them into vaulted, toothlike scales; hinge margin very narrow; teeth two in each valve, seeming to rise out of the cavity of the beaks and curving upwards; in the right valve one tooth is prominent and furrowed; the other, arising a little before it, and a little deeper within the shell, is quite short; in the left valve is one large, prominent tooth, so deeply divided as to resemble two, and directly behind it, diverging widely in the direction of the margin, is a thin, much elevated tooth. Muscular impressions faint, connected by a very deeply notched pallial impression; furrows within answer to ribs without. Length, one and one fourth inches; height, seven tenths of an inch; breadth, three fifths of an inch. I have seen one specimen two and one half inches long.

Fig. 398.



P. pholadiformis.

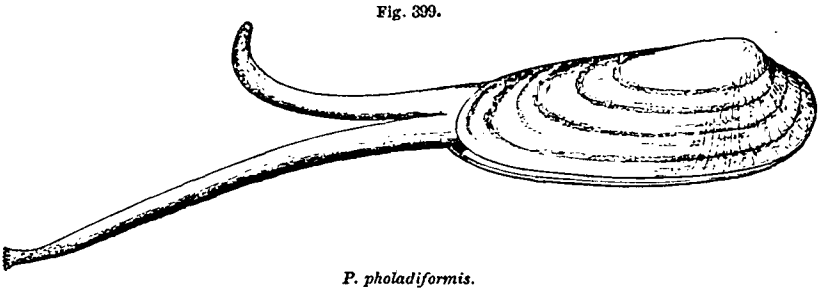
Found on various parts of our coast; at Chelsea and Nahant beaches it is found abundantly, imbedded in jutting fragments of a marsh which once existed there, but which has been washed away by inroads of the sea, and now only an occasional remnant lifts its head above the surrounding sand. Also found in great quantities boring into hard blue clay, at low-water mark, on Phillip's Beach. Sable Island, rare (*Willis*).

Deshayes remarks that it is a very extraordinary shell on account of its exterior aspect, which would lead one to mistake it for a small *Pholas*. To any one who has seen a *Pholas*, the resemblance is striking; but the want of any wide gaping, and the articulated hinge, at once correct the first impression; the teeth are so long and slender that it is a rare thing to find a specimen in which some of them are not fractured.

The animal, according to the observations of the Rev. J. L. Russell, has two tubes or siphons extending from the longer end, united

at their bases, the orifice of the one, for imbibing water, fringed with a circle of branching or feathery filaments consisting of four long and four short ones; and the same number of obtuse points

Fig. 399.



P. pholadiformis.

without fringe surround the orifice of the other tube; foot triangular, long, narrow, elevated; mantle united except at the orifices for the siphons and foot. Dr. Stimpson says the cirri at the orifice of the siphons are very variable, sometimes being entirely wanting or only represented by tubercles.

Petricola dactylus.

Fig. 41.

Shell elongated-ovate, chalky-white, very inequipartite, covered with radiating lines and ribs; no areola before the beaks; teeth, two in the right, and three in the left valve.

Petricola dactylus, Say (not Sowerby), Amer. Conch. pl. 60, fig. 2 (1834). — De Kay, Nat. Hist. New York, 228, pl. 28, fig. 283.

This shell very closely resembles the preceding, and will be best described by a comparison with it. It has a more ovate form, the basal margin being considerably arcuated; the anterior extremity is higher and obtusely rounded; there is no marked areola before the beaks, but a deep depression under them; the ligament is longer; the radiating lines are more numerous, the rib-like anterior ones are more numerous (about sixteen), less elevated, and the lines of growth merely undulate over them without being raised into vaulted scales; in the right valve are two teeth similar to those in *P. pholadiformis*, but shorter and grooved; in the left valve, instead of the large, cleft tooth, we have two teeth, the division between them answering to the cleft in the other species; the large middle tooth is folded, and the posterior one is very slender. Length, one and

three fourths inch; height, three fourths of an inch; breadth, eleven twentieths of an inch.

Sent to me by Dr. L. M. Yale from Martha's Vineyard. Gull Island (*Smith*).

It is a proportionally shorter and broader shell; but its most obvious mark of distinction is the want of an areola before the beaks.

[Dr. Stimpson remarks: "I have found the differences between this and the preceding species, mentioned by Dr. Gould, to be inconstant." There is much doubt in my own mind also in regard to its title to a separate name, as I have seen no extended series for comparison. The shell figured in Sowerby's Thesaurus is widely different from this, and is probably a South American species.

Family TELLINIDÆ, Latreille.

Not more than two cardinal teeth on the same valve; a lateral tooth each side when not obsolete; ligament on the shorter end; pallial sinus very large; animal with long slender separate siphons; mantle open.

Genus MACOMA, Leach. 1819.

Shell equivalve, sub-ovate, compressed, rounded anteriorly, subrostrate posteriorly, slightly gaping at ends, with posterior sub-marginal flexure; hinge with two small cardinal teeth in each valve; pallial impression with a deep sinus. Animal with one simple fringe on each side.

Macoma fusca.

Fig. 42.

Shell compressed, ovate-orbicular, sub-equipartite, rounded before and somewhat pointed behind; white, covered with a dusky epidermis; teeth, two in each valve, the largest of which is grooved.

Lister, t. 405, fig. 250.

Psammobia fusca, Say, Journ. Acad. Nat. Sc. v. 220 (1826).

Sanguinolaria fusca, Conrad, Amer. Mar. Conch. 34, pl. 7, fig. 1 (1831). — Stimpson, Sh. of New Eng. 20; Inv. Gr. Man. 2d ed. 21. — Gould, Inv. Mass. 1st ed. 66. — De Kay, Nat. Hist. N. Y. 212, pl. 32, fig. 304. — Mighels, Bost. Journ. N. H. iv. 317.

Tellina fusca, Phil. Abbild. t. 3, fig. 3.

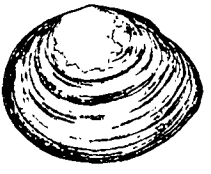
Tellina inconspicua? Sowerby, Zool. Journ. iv. 359. — Gray, Zool. Beech. Voy. 153, pl. 41, fig. 6. — Hanley, in Sowerby, Thes. Conch. 317, pl. 59, fig. 120.

Tellina Grönlandica, Beck, see Lyell, Tr. Geol. Soc. Lond. 1841, vi. 137, pl. 16, fig. 8.

Tellina Balthica, Lin.
Tellina solidula, Hanley, in Sowerby, Thes. Conch. 318, pl. 59, figs. 109, 110. — Middend. Siber. Reise, 100, pl. 22, figs. 3–6.
Venus fragilis, O. Fabr. F. Grœnl. 413.

Shell thin, white, compressed, ovate-orbicular, nearly equipartite, height nearly equal to length, rounded before, somewhat narrowed and pointed behind; beaks minute; an imperfect ridge or fold runs from the beaks to the posterior termination; surface finely wrinkled by the lines of growth, covered by a whitish or dusky epidermis; ligament exterior; two unequal parallel teeth in each valve, the large one opposing the small one in the other valve, and deeply grooved or cleft; muscular impressions distinct. Length, nine tenths of an inch; height, seven tenths of an inch; breadth, seven twentieths of an inch.

Fig. 400.



M. fusca.

The animal has a triangular foot, and long, separate, slender siphons which may be flexed and contorted in any form; the upper one is longer and more slender, the lower has the orifice fringed. When buried in the mud the siphons are protruded into the water.

This is one of our most abundant bivalve shells. It is thrown up on every beach, and appears to live everywhere in shallow, still water. Multitudes appear in the mud which is obtained about Boston at low tide for raising wharves, extending the land, &c.

Eastport, rare (*Cooper*); Halifax and Fishing Banks (*Willis*); up the St. Lawrence to near Quebec (*Bell*); Greenland (*Möller*); James's Bay, 52° 10′ (*Drexler*); coast of Maine (*Mighels*).

Its varieties in size, solidity, and color are very great. In muddy bays they grow to a large size, are thick, and of a bluish or sometimes a rusty color, and are covered with a firm, dark epidermis. In clean, sandy localities they are very delicate and thin, pure white or sometimes of a delicate rose-color, or lemon-color, and the epidermis is very slight.

All recent authors, except Deshayes, agree in calling this a *Sanguinolaria*.

It is undoubtedly identical with *Tellina Grönlandica* of Beck; and it certainly is very like, if not identical with, Sowerby's *T. inconspicua*, published in the "Zoological Journal." The young, delicate, white, or rose-tinted ones accord in every respect with *T. Balthica*.

[According to subsequent observations *T. inconspicua* is not this

shell, and is much more rounded posteally; *T. solidula* is also believed to be different, with the beaks removed farther backwards, and *T. balthica* is a more delicate form of it. *T. Grœnlandica* seems to be a rounded form, very abrupt posteally, according with a specimen sent by Mörch and named *T. tenera*, Leach.

Macoma proxima.

Shell sub-oval, thin, white, covered with a dusky epidermis; anterior part semi-oval, and longest, posterior termination somewhat angular; hinge teeth two in each valve, one of which is cleft.

Tellina sordida, Couthouy, Bost. Journ. Nat. Hist. ii. 59, pl. 3, fig. 11. — Mighels, Journ. B. S. N. H. iv. 317. — Philippi, Abbild. (Tell.) pl. 3, fig. 6.
Sanguinolaria sordida, Gould, Inv. Mass. 1st ed. 67.
Tellina proxima, Gray, Zool. Beechey's Voy. 154, pl. 44, fig. 4. — Smith, Wern. Trans. viii. 105, pl. 1, fig. 21. — Hanley, in Sowerby, Thes. Conch. i. 313, pl. 66, fig. 264, pl. 59, fig. 115. — Forbes and Hanl. Br. Moll. i. 307, pl. 21, fig. 1, and pl. 183, fig. 3. — Philippi, New Conch. (Tellina) ii. pl. 5, fig. 4. — Stimpson, Inv. Gr. Manan, 21; Shells of New England, 21.
Tellina lata, Gmél. from figure of Lister, pl. 407, fig. 253. — Lovèn, Moll. Scand. 41.
Tellina calcarea, Lyell, Phil. Trans. 1836. — Forbes, Mem. Geol. Surv. i. 411.
Tellina tenera, Leach, Append. Ross's Voy. i. 175 (1819); Journ. Phys. lxxxviii. 465 (1819). — Gray, List Br. Mus. (Br. Moll.) 42.
Tellina sabulosa, Spengl., Mörch, Moll. Grœnl. 18.

Shell sub-oval, compressed, thin and brittle, slightly gaping, inequilateral, the anterior side being longest and semi-oval; behind the beaks the margin declines rapidly in nearly a straight line, forming a rounded angle as it joins the base, and bordered by a faint, roughened wave; surface somewhat undulated by the lines of growth, especially on the anterior slope, and covered by a thin, dusky or dirty-white epidermis; beaks minute; cardinal teeth two in each valve, a large one which is cleft, and a very delicate one which is seldom entire; lateral teeth wanting, or consisting of a feeble compression and elevation of the posterior hinge margin; sinus of the pallial impression nearly reaching the anterior muscular impression; interior bluish-white. Length, nine tenths of an inch; height, six tenths of an inch; breadth, one fourth of an inch.

Fig. 401.

M. proxima.

Found in considerable numbers, and in a fresh state, in fish caught off Nahant. Eastport, thin (*Cooper*); Fishing Banks (*Willis*); St. Anne, Marcouin (*Bell*); Hannah Bay (James's Bay), dead (*Drexler*); Northwest coast of Greenland (*Hayes*).

Fossil in many places, under the names of *T. ovalis*, Woodward; *T. ovata*, Sowerby; *T. obliqua*, Sowerby, &c. Beauport; Montreal (*Dawson*); Uddevalla (*Jeffreys*); Portland (*Mighels*); Greenland (*Möller*).

It is quite clear that this shell belongs to the same genus as Say's *Psammobia fusca*. The hinge is precisely the same, and the slight wave along the posterior margin is no more conspicuous than in that shell. Its habit and general aspect are also the same.

Genus TELLINA, Lin. 1758.

Shell elongated, sub-equivalve, compressed, angular, and somewhat rostrated at the posterior end, where there is an irregular, wave-like fold; two small cardinal teeth, and generally two lateral teeth in each valve.

Tellina tenta.

Fig. 43.

Shell white, oval, behind shortest, narrowed, very much warped and widely gaping; lines of growth very fine; within polished, and with numerous fine, radiating lines.

Tellina tenta, Say, Amer. Conch. pl. 65, fig. 3. — De Kay, Nat. Hist. New York, 210. — Adams, Bost. Journ. Nat. Hist. iii. 232. — Stimpson, Shells of New England, 21.

Shell small, thin, white, oval; beaks pointed, moderately prominent behind the middle; posterior part narrowed, the point slightly truncated, the posterior hinge-margin curvilinear; valves very convex, the left one most so, widely gaping, and very far bent to the right; posterior fold distinct on the right valve; outer surface shining, but not polished, minutely wrinkled by the lines of growth, and with a few fine, radiating lines across the middle; inner surface polished, white, tinted with yellow, and covered with radiating lines, which produce a finely indented margin. Hinge very delicate, with two diverging cardinal teeth on the right valve, and a single one on the left; a posterior lateral tooth on the right valve, and a corresponding groove on the left; ligament minute, prominent; muscular and pallial impressions distinct. Length, three fifths of an inch; height, two fifths of an inch; breadth, one fifth of an inch.

Fig. 402.

T. tenta.

Found by Professor Adams in 1838 in Dartmouth Harbor; and

in 1839 he obtained numerous single valves in mud dredged up in New Bedford Harbor. Mr. Say received it from South Carolina.

This is a distinctly characterized, true *Tellina*, and differs from all others of our shores. It is larger than *T. tenera*, and has not its polished surface. It differs from others principally in its less triangular, strongly warped, and widely gaping posterior portion, and the radiating lines within.

Tellina tenera.

FIG. 44.

Shell oblong, sub-oval, thin, white, iridescent, delicately marked by the lines of growth; inequipartite, shortest and pointed behind; posterior lateral tooth obsolete.

Tellina tenera, SAY, Journ. Acad Nat. Sc. ii. 303. — DE KAY, New York Moll. 209, pl. 26, fig. 271. — STIMPSON, Shells of New England, 21.

Shell small, thin, and delicate, sub-oval, or, if we regard the posterior portion, sub-triangular; slightly longest and semi-oval before the beaks; the posterior slope sudden and nearly straight, forming a blunted angle by its junction with the base; marginal fold well marked; surface regularly and delicately marked by sharp lines of growth; color white, or slightly tinged with rose-color, and iridescent; ligament short and prominent; cardinal teeth two in each valve, the posterior one of the left valve rudimentary, the principal one in each valve grooved; lateral tooth on the longer side distinct; that on the shorter side, just behind the ligament, scarcely perceptible; sinus of the pallial impression nearly reaching the anterior muscular impression. Length, eleven twentieths of an inch; height, seven twentieths of an inch; breadth, five fortieths of an inch.

Fig. 403.

T. tenera.

Found abundantly cast upon all our sandy beaches, and probably lives not far from low-water mark. Fishing Banks, Nova Scotia, rare (*Willis*).

It is a very pretty little species, its beauties becoming developed by examination. There are two other species closely allied to it; the *T. polita*, which is a somewhat larger and stronger shell, its posterior angle more prolonged and sharper, and its surface smooth, glossy, porcelain-white; also *T. iris*, of about the same size, solidity, and color, but its surface is marked by oblique grooved lines which at once distinguish it. This is not found on our shores, nor am I certain that *T. polita* has been. It is not likely to be confounded with any other shell.

Family LUCINIDÆ, Gray.

Shells more or less orbicular, compressed, surface sculptured; animals with no protruding siphons, branchiæ coalescing into one leaflet, pallial impression entire.

Genus LUCINA, Brug. 1792.

Shell rounded, beaks small; two diverging cardinal teeth, one of which is bifid, and usually two marginal teeth, one of them near the cardinal teeth in each valve; there is sometimes a posterior angle, but never a fold, as in *Tellina;* pallial impression without a sinus. Animal with the mantle freely open in front, fringed; no protruding siphons; foot long and tubular.

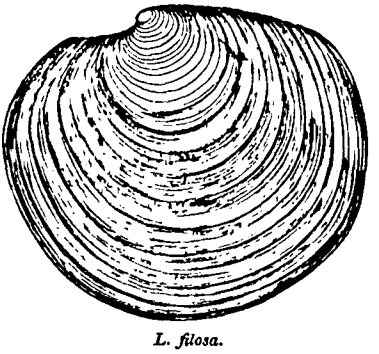
Lucina filosa.

Shell orbicular, compressed; surface with numerous remote, concentric, laminated striæ; lunule depressed-lanceolate; lateral teeth wanting.

Lucina radula, Gould, Inv. Mass. 1st ed. 69. — De Kay, Nat. Hist. New York, 214.
Lucina radula? Mighels, Bost Journ. Nat. Hist. iv. 318.
Lucina filosa, Stimpson, Shells of New England, 17.

Shell white, thick, orbicular, regularly but moderately convex; hinge-margin straight; beaks small, pointed, slightly prominent, inclining forwards over a small, indented, smooth, lanceolate lunule; on each side of the hinge runs a shallow oblique furrow, which, terminating in the margin, causes a slight undulation. Surface covered with remote, concentric, lamellar ridges, in the intervals of which are several rounded, thread-like striæ, and often minute radiating lines; interior chalky-white, except around the margin, where it is polished; with radiating lines, most apparent near the margin. Hinge straight, without marginal teeth, and with a single cardinal tooth in the left valve, and two small, diverging ones in the right. An-

Fig. 404.



L. filosa.

terior muscular impression very narrow, and directed obliquely to the centre of the valves. Length, one and one half inches; height, the same; breadth, six tenths of an inch. A specimen dredged by Dr. Stimpson in Boston Harbor has the diameter, one and seven eighths of an inch; breadth, seven eighths of an inch.

This must be considered a rare shell, and an inhabitant of deep water. A few valves have been picked up on our beaches after severe storms. It is a common shell on the other side of the Atlantic. In six fathoms sand, Point Shirley (*Stimpson*); on Phillips's Beach after a storm, alive (*Holder*).

Dr. Stimpson has very truly pointed out the distinction between the *L. radula* of Montagu and our shell. The latter is larger, more compressed, thinner, more muddy-colored, and the concentric laminæ are more elevated and more distant.

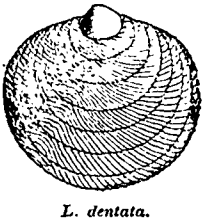
Lucina dentata.

Shell white, orbicular, lenticular, sculptured with grooves bent obliquely downwards at both sides; lateral teeth obsolete; margin dentated.

Pectunculus parvus, List. Conch. t. 301, fig. 142.
Tellina divaricata, Gmél. Syst. iv. 3241. — Chemn. Conch. vi. 134, pl. 13, fig. 129. — Dillwyn, Catal. i. 102. — Turt. Conch. Dict. 178.
Lucina dentata, Wood, Gen. Conch. 195, pl. 46, fig. 7; Index Test. (Tellina) pl. 4, fig. 88.
Lucina divaricata, Lam. An. sans Vert. 2d ed. vi. 226; An. du Mus. vii. 239. — Desh. Encyc. Méth. Vers., iii. 376, pl. 285, fig. 4. — Blainv. Malacol. pl. 72, figs. 3, 3 *a*. — Gould, Inv. Mass. 1st ed. 70. — De Kay, Nat. Hist. New York, 214, pl. 26, fig. 273. — Chénu, Man. de Conch. ii. 120, fig. 572.
Lucina strigilla, Stimpson, Shells of New England, 17.

Shell white, thin, rounded, regularly convex, sub-equipartite; beaks elevated, inclined forwards, in front of which is a long and narrow areola somewhat crested. Surface glossy; stages of growth strongly marked; deeply sculptured with regularly disposed, remote, and nearly parallel lines, flexed at nearly right angles along the anterior third, so as to pass obliquely downwards towards both ends, and forming teeth around the entire margin, most prominent behind. Hinge margin nearly straight. Teeth, one in the right valve, very small, and two small, diverging ones in the left valve. Marginal teeth wanting or rudimentary. Ligament almost entirely concealed. Length, one inch; breadth, three fifths of an inch; height, nine tenths of an inch.

Fig. 405.



L. dentata.

This shell, so remarkable for its universal dispersion, as well in a fossil as in a living state, is not unfrequently thrown upon our ocean shores in such a state as to indicate a neighboring residence. At Nantucket it is far from rare. It is found on every Atlantic shore, even to the Southern Ocean. Vineyard Sound (*Desor*).

It varies considerably in the development of the lateral teeth, and in the approximation of the striæ.

[There can be no doubt that this shell is not the *divaricata* of Linnæus, as was supposed in the first edition; that name referring, as shown by Forbes and Hanley, to a smaller European species. Dr. Stimpson has applied to it — rather unfortunately, I think — the name *strigilla*, which had been previously given as a generic name to a group which is sufficiently peculiar to justify a distinguishing name, and which he himself also uses as such. I have rather adopted the prior and more appropriate name of Wood.

Genus CRYPTODON, Turton. 1822.

Rounded, thin, nearly equipartite; valves with a depression bordering the hinder end; a minute cardinal tooth in the right valve.

Cryptodon Gouldii.

Fig. 52.

Shell small, globose-triangular, white, interior with minute radiating lines.

Lucina flexuosa, Gould, Inv. Mass. 1st ed. 71, fig. 52.
Cryptodon flexuosus, Adams, Gen. pl. 114, figs. 2, 2*a*.
Lucina Gouldii, Philippi, Zeitsch. f. Malak. 1845, 74.
Thyasira Gouldii, Stimpson, Shells of New England, 17; Invert. Gr. Manan. 21.
Cryptodon Gouldii, Stimpson, Check List, 2.

Shell minute, white, ovate-globose, or somewhat triangular, nearly equilateral; beaks prominent, inclined forwards, and having a rounded depression in front of them; behind them, a remarkable widened groove runs near the margin to the posterior base, producing a deep indentation in the outline of the margin at that part; elsewhere regularly rounded; surface smooth, dead white. Hinge with only the vestige of a cardinal tooth, and no lateral ones. Ligament long and rather large, partly concealed. Interior glossy white, with minute radiating lines. Length, three tenths of an inch; height, somewhat more; width, one tenth of an inch.

Fig. 406.

C. Gouldii. 2/1

It inhabits deep water, and is very frequently taken from codfish, caught in Massachusetts Bay. On sandy bottoms, whole coast; Eastport in five fathoms; Grand Manan, off Duck Island, four fathoms sand (*Stimpson*); Salem Harbor (*Wheatland*); Stonington (*Linsley*).

There can be no doubt that this is identical with the British shell, though the specimens I have seen are much smaller than the foreign specimens usually are.

I have arranged it under the genus *Lucina*, as most of its characters pertain to it, and none of them seem absolutely to forbid. The genus *Cryptodon* has, however, been formed by Turton to embrace this shell, on account of its single tooth.

[Philippi has well shown that our species is quite different from that of Europe above named. The marks he has designated are sufficiently distinctive, viz. ours is much smaller, more oblique, the hinder end on which the folds are situated is shorter, the lunule is less deep, and the anterior margin is not concave, but rather convex. Indeed the disparity in size and outline is so great as scarcely to suggest a comparison. Having now seen large numbers agreeing in character, I must thus reverse my opinion.

Family CYCLADIDÆ, Woodward.

Shell suborbicular, closed; ligament external; epidermis thick, horny; hinge with cardinal and marginal teeth; pallial line simple, or very slightly inflected. Animal with open, simple mantle; siphons more or less united, orifices plain; two unequal gills each side; foot large, tongue-shaped.

Genus SPHÆRIUM, Scopoli. 1777.

Shell small, thin, ovate-globose; hinge with two minute cardinal teeth in each valve, but sometimes in one only; also compressed, marginal teeth; inhabits fresh water.

Sphærium simile.

Fig. 53.

Shell oval, truncated at the extremities in young, and rounded in adult specimens, convex, sub-equipartite; beaks slightly elevated; surface with conspicuous concentric wrinkles; epidermis dark chestnut-brown.

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Cyclas similis, Say, Nicholson's Encyc. 1st Amer. ed. ii. pl. 1, fig. 9 (1816). — De Kay, Nat. Hist. New York, 222, pl. 25, figs. 264, 265 — Lewis, Proc. Bost. Soc. Nat. Hist. v. 122; vi. 2. — Also Jay, Adams, Linsley, and Michels.

Cyclas sulcata, Lam. An. sans Vert. v. 560 (1818), 2d ed. vi. 271. — Delessert, Receuil, pl. 7, fig. 3. — Stimpson, N. E. Mollusks, 16.

Cyclas Sarratogea, Lam. An. sans Vert. v. 560 (1818); 2d ed. vi. 271. — Delessert, Receuil, pl. 7, fig. 9.

Cyclas gigantea and *ponderosa*, Prime, Proc. Bost. Soc. Nat. Hist. iv. 157 (1851).

Sphærium sulcatum, Prime, Pr. Ac. Nat. Sc. xi. 299 (1860); xii. 403.

Cyclas rhomboidea, De Kay, Nat. Hist. New York, 224, pl. 25, fig. 263 (1842). — C. B. Adams, in Thomps. Verm. 168. — Stimpson, Shells of New England, 16. — Linsley, Sillim. Journ. xlviii. 276.

For full synonymy see Prime's Synonymy of Cyclades, in Proc. Acad. Nat. Sc. xi. 299.

Shell sub-oval, nearly equipartite, varying much in its outline. In the adult shell the extremities are broadly and nearly equally rounded, the posterior part being somewhat the longest and most pointed, the base very little curved; valves very convex, remarkably broad across the beaks, which are but slightly elevated; color dark chestnut-brown, within bluish. The young shell is thin and compressed, the hinge-margin nearly a straight line, the extremities truncated so as to give the shell a quadrilateral form; and the color is a light lemon-color, or honey-yellow. The intermediate specimens exhibit all the gradations of shape or color between the old and young. Surface at every stage regularly wrinkled concentrically, with strongly raised, sharp lines of growth, and generally a more conspicuous wave marking the former year's growth of the shell; beaks usually eroded. Hinge with minute, very oblique, cardinal teeth, the marginal ones distinct, strong, and white. Length, seven tenths of an inch; height, half an inch; breadth, two fifths of an inch.

Fig. 407.

S. simile. Enlarged.

Found in the larger ponds and rivers, especially along the muddy banks of the Connecticut. New England and Northern States. Lachine Canal, Metis Lake (*Bell*); Truro, Nova Scotia (*McCulloch*).

This species is closely allied to the *C. rivicola* of Europe in shape and size; its raised concentric striæ, however, appear to be much more prominent. It may always be distinguished by these conspicuously raised lines, for they are exhibited by no other American species in so great a degree. Several other species are described

as having them, such as are named under the synonymes; but they are probably all of them varieties of this species. The young, differing widely as it does from the adult, has been commonly received in our cabinets as Say's *C. rhomboidea*. A specimen one fourth of an inch long would answer very well to his description. What the true *rhomboidea* is, I have not yet been able to satisfy myself. The two species of Lamarck, also, I believe to be varieties of this shell; and very probably his *C. striatina* also.

[Mr. Prime, by an examination of specimens in the Jardin des Plantes, has come to the conclusion, no doubt correctly, that this is certainly *C. sulcata* of Lamarck, and has given that as the prior name. He seems not to have seen the first edition of Nicholson's Encyclopædia, in which Say gave his description, which bears date two years earlier (1816).* *C. Sarratogea*, however, represents the adult shell, according to Delessert's figures, and *C. sulcata* and *striatina*, young forms.

Sphærium partumeium.

Fig. 54.

Shell rounded-oval, sub-equipartite, lowest anteriorly, somewhat angular behind; thin and fragile; valves very convex, minutely wrinkled by lines of growth, and obsoletely radiated; light horn-color; beaks elevated.

Cyclas partumeia, Say, Journ. Acad. Nat Sc. ii. 380 (1822). — Ferussac, Mag. de Zool. 1835. — De Kay, Nat. Hist. New York, 223, pl. 25, fig. 262. — Stimpson, Shells of New England, 16. — Prime, Proc. Bost. Soc. Nat. Hist. iv. 165, 278. — Mighels, Shells of Maine, 12, in Journ. Bost. Soc. Nat. Hist. iv. 318.

Cyclas cornea, var. 2, Lam. An. sans Vert. vi. 268 (1835). — C. B. Adams, in Thomp. Verm. 168. — Gould, Inv. 1st ed. 73; Catal. 30.

Cyclas cærulea, Prime, Proc. Bost. Soc. iv. 161 (1852).

Cyclas mirabilis, Prime, ibid. iv. 167 (1852).

Sphærium cæruleum and *mirabile*, Prime, Adams's Gen. ii. 450.

Sphærium partumeium, Prime, Pr. Ac. Nat. Sc. xi. 296 (1860).

Sphærium partumium, Prime, Op. cit. xii. 29.

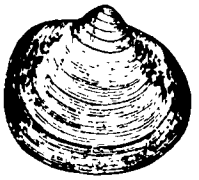
See Prime's Synonymy of Cyclades, in Proc. Acad. of Sciences, xi. 296.

Shell rounded-oval, highest behind, thin, fragile, pellucid, somewhat inflated; beaks nearly central, moderately elevated, inclining inwards; hinge-margin nearly straight, passing by a regular curve into the rounded anterior extremity, but curving suddenly behind,

* Dr. Gould is incorrect in regard to the date. The second volume of the first edition, containing Mr. Say's article Conchology, bears the date of 1817. The only public library which to my knowledge contains this edition is that of the U. S. Naval Academy at Annapolis. — W. G. B.

so as to form a conspicuous obtuse angle, causing this end to appear higher, and giving the whole shell a somewhat rhombiform appearance; basal margin regularly rounded; valves very tumid, especially in mature shells; surface shining, inconspicuously wrinkled by the lines of growth, with very indistinct, radiating lines; color of the young very light-yellowish; of the adult light-greenish horn-color, with a marginal border of lilac or yellow; cardinal teeth small, diverging; marginal teeth strong, white; interior tinged with lilac. Length, nine twentieths of an inch; height, two fifths of an inch; breadth, four fifteenths of an inch.

Fig. 408.



S. partumeium. Enlarged.

Found everywhere in fresh-water brooks and ditches, in mud, or more usually imbedded among submerged turf and roots of water-plants and shrubs. Truro, Nova Scotia (*McCulloch*); nearly all lakes, Nova Scotia (*Willis*).

The animal is of a light, delicate pink color, and draws itself about rapidly.

The general resemblance of this shell to the *C. cornea* of Europe is very close. Its size, color, delicacy, and tumid form are the same. But that species has the beaks much less elevated, is broader from side to side, and the two ends are almost precisely alike, without any angle or any widening behind. Our shell is, on the whole, more delicate. It is unquestionably the variety noticed by Lamarck, as coming from America. The young and old differ both in shape and color. The young are less tumid and longer, and the disparity of the parts is much greater than in the adult. They have also a light honey-yellow color and great transparency. They would scarcely be recognized as the same species except by being found in company, and also by being actually found within the adult shell.

Sphærium rhomboideum.

Fig. 55.

Shell rhombic-orbicular, tumid, beaks not prominent, sub-equipartite; color olivaceous, margined with yellowish; surface elegantly marked with fine concentric ridges.

Cyclas rhomboidea, Say, Journ. Acad. Nat. Sc. ii. 380 (1822). — Prime, Ann. N. Y. Lyc. vi. 66, pl. 1, fig. 4 *a*, *b* (1853); Proc. Bost. Soc. iv. 272 (1852).

Sphærium rhomboideum, Adams, Gen. ii. 450 (1858). — Prime, Proc. Ac. Nat. Sc. xi. 297 (1860), xii. 406.

Sphærium elegans, H. and A. Adams, Gen. ii. 450 (1858).

Cyclas elegans, ADAMS, Bost. Journ. Nat. Hist. iii. 330, pl. 3, fig. 11 (1840); in Thompson's Nat. Hist. Vermont, 163. — GOULD, Inv. Mass. 74, fig. 55. — DE KAY, Nat. Hist. New York, 224. — C. B. ADAMS, Shells of Vermont, 30. — STIMPSON, Shells of New England, 16. — PRIME, Proc. Bost. Soc. iv. 165.
Cyclas cornea, var. 3, LAM. An. sans Vert. 2d ed. vi. 268.

Shell in its younger stages compressed, in an adult state tumid, sub-globular, the extremities truncated or terminating abruptly, so as to appear somewhat four-sided or rhomboidal; beaks not prominent, the anterior side a very little the shortest and narrowest; basal margin nearly straight and parallel to the upper margin; the valves are not regularly convex, but somewhat flattened down the middle, so as to exhibit an obtusely rounded ridge passing from the beaks towards each lower angle; surface delicately marked with fine, rounded, concentric wrinkles; color olive-green, with a straw-colored margin, and narrower zones at each stage of growth. Hinge rather strong, the cardinal teeth rudimentary, the lateral ones large and strong. Interior bluish. Length, nearly one half an inch; height, seven twentieths of an inch; breadth, eleven fortieths of an inch.

Fig. 409.

S. rhomboideum. Enlarged.

Found in a ditch running through the Cambridge meadows, near Fresh Pond. Vermont, Connecticut, New York, Ohio (*Prime*).

This is a remarkable and beautiful species, and seems to be rather rare. Excepting the above locality, I know of no other but at Weybridge, Vermont, whence it was sent me by Prof. Adams. It is about the size and width of *S. partumeium*, but is a very much thicker shell, differently colored and sculptured, and its four-sided, angular outline is quite different. The young of *S. simile*, though equally four-sided, is much longer proportionally, the color much darker, and the ridges on the surface much coarser. In this species the four sides are nearly equal.

[Mr. Prime after much investigation, and finding it to answer to all the terms of Say's description, concludes the above species to be the long-sought-for *C. rhomboidea*, and in this conclusion I concur.

Sphærium Vermontanum.

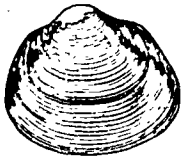
Shell very oblique and tumid, anterior margin very abrupt.

Sphærium Vermontana, PRIME, Proc. Ac. Nat. Sc. xii. 128 (1861).
Sphærium Vermontanum, PRIME, Proc. Ac. Nat. Sc. xii. 408 (1861).

Shell very oblique, tumid, inequilateral, full; anterior margin abrupt, posterior drawn out to an angle, basal slightly curved;

beaks large, full, prominent, placed very much towards the anterior, in which direction they are slightly inclined; sulcations coarse, moderately regular; epidermis light green; ligament conspicuous; valves solid, interior light blue; hinge-margin much curved, broad; cardinal teeth strong, representing the letter V reversed; lateral teeth elongated, strong. Length, nine sixteenths of an inch; breadth (height), six sixteenths of an inch; breadth, four sixteenths of an inch.

Fig. 410.



S. Vermontanum. Enlarged.

Inhabits Lakes Champlain and Memphramagog, Vermont. Quite rare.

Remarkable for its very oblique and tumid shape, and for the abruptness of its anterior margin. Compared with *S. stamineum* it is more tumid and less heavily sulcated; it is less elongated and more tumid than *S. striatinum*. (Copied from Proc. Acad. Nat. Sc. xii. 408.)

Sphærium truncatum.

Shell thin and lucid, olivaceous, beaks elevated, hinder end truncated.

Cyclas truncata, Linsley, described by Gould in Sillim. Journ. new series, vi. 234, wood-cut 3 (1848). — Prime, Proc. Bost. Soc. iv. 165. — Jay, Catal. 4th ed. 466.

Cyclas calyculata, C. B. Adams, Sillim. Journ. xl. 277 (1841); in Thompson's Nat. Hist. Verm. 168 (1853); Land and Fresh-Water Shells of Vermont, 18.

Cyclas pellucida, Prime, in Stimpson's Shells of New England, 16 (1851); Proc. Bost. Soc. iv. 277 (1852).

Sphærium truncatum, Adams, Gen. ii. 451 (1858); Prime, Proc. Acad. Nat. Sc. xi. 301 (1860); Op. cit. xiii. 35 (1862).

Sphærium pellucidum, Adams, Gen. ii. 450 (1858).

Shell rather large, thin, fragile, lucid, rather tumid, rounded-oval, beaks a little anterior, elevated and tumid, posterior part highest and abruptly rounded so as to appear somewhat truncated; anterior end regularly rounded; ventral margin very little curved; surface delicately and regularly striated by the lines of growth; epidermis pale horn-color inclining to olive. Interior bluish. Hinge-margin delicate, cardinal teeth obtuse, very minute, marginal teeth slender but well developed. Length, one third of an inch; height, one fourth of an inch; breadth, one fifth of an inch.

Fig. 411.

S. truncatum. Enlarged.

Found in the New England States, New York, and Ohio.

It is nearly allied to *S. partumeium*, but is less tumid, posteriorly more elevated, and somewhat squarely clipped. It is very closely allied to *S. lacustre*, Fer. (*C. calyculata* of most authors), and by some has been regarded as identical with it.

Sphærium tenue.*

Cyclas tenuis, PRIME, Bost. Proc. iv. 161 (1851); Mon. of *Cycladidæ*, &c.

Shell small, transversely oblong, pellucid, moderately full, subequilateral; anterior and basal margins rounded, posterior margin sub-abrupt; beaks nearly central, not prominent, calyculate; striations very fine and regular, hardly perceptible; epidermis glossy, light straw-color; valves slight, interior straw-color; hinge-margin short, narrow, nearly straight; cardinal teeth very diminutive, lateral teeth small, elongated. Length, eighteen hundredths of an inch; breadth, twelve hundredths of an inch; width, six hundredths of an inch.

Fig. 412.

S. tenue. Enlarged.

In the Androscoggin, Maine, and in the Upper Mackenzie, British America.

This species, the smallest one known to inhabit the United States, was discovered some years since by Mr. Girard, from whom I obtained my specimens. It may possibly be the young of some species, but if so, it would be very difficult to say which; setting aside its diminutive size, it appears to have all the characteristics of a mature shell. In outline it seems to be allied to *S. transversum;* it is, however, more inflated, less elongated, and its margins are more rounded. At first sight it might readily be mistaken for a *Pisidium* (*Prime*).

Sphærium securis.

Shell small, rhomboidal, disks tumid, pinched at each end, beaks elevated, hinder end truncate.

Cyclas securis, PRIME, Proc. Bost. Soc. iv. 160, 276 (1852); Ann. Lyc. v. 218, pl. 6. — LEWIS, Proc. Bost. Soc. v. 122. — JAY, Catal. 4th ed. 466.

Sphærium securis, ADAMS, Gen. ii. 450 (1858). — PRIME, Proc. Acad. Sc. xi. 298 (1860), xii. 34.

Cyclas cardissa, PRIME, Proc. Bost. Soc. iv. 160, 277.

Sphærium cardissum, PRIME, Proc. Acad. Sc. xi. 289 (1860). — ADAMS, Gen. ii. 450 (1858).

Cyclas crocea, LEWIS, Proc. Bost. Soc. v. 25 (1854), vi. 2.

Shell small, trapezoidal, slightly oblique, acutely rounded in front, more elevated posteriorly and obliquely truncate, beaks elevated and

* This species was represented in Dr. Gould's MSS. by a blank sheet, which I have filled up from Mr. Prime's Monograph of *Cycladidæ*, published by the Smithsonian Institution. Professor Henry has kindly allowed me to use the wood-cuts prepared for that work, and Mr. Prime has also furnished some. — W. G. B.

tumid, nearly central, dorsal aspect broad, acutely rhomboidal, presenting a broad, deep, and long depression each side of the beaks; side aspect tumid down the disk, somewhat pinched and prolonged at each end so as to give the appearance of a ridge from the apex to each ventral end; ventral margin slightly curved and the adjacent part of the disk wedge-shaped; end views heart-shaped; surface with fine concentric ridges, shining, horn-color with occasional yellowish zones. Hinge-margin narrow, a little curved; teeth very small; marginal teeth slight, elongated. Animal pinkish, so as to give the shell a pinkish hue. Diameter about one third of an inch; breadth, one fourth of an inch.

Fig. 413.

S. securis. Enlarged.

Inhabits Fresh Pond, Cambridge, and Salem; also Vermont, New York, and Pennsylvania.

Less lenticular than *S. partumeium*, and more obliquely truncate than *S. truncatum;* it is smaller, thicker, more tumid, and more shining than either, and the peculiar pinching at the ends is quite characteristic.

Sphærium occidentale.

Shell regularly oval, minute, pellucid, equipartite, striæ very fine.

Cyclas ovalis, PRIME, Proc. Bost. Soc. iv. 276 (1852); preoccupied.
Sphærium ovale, ADAMS, Gen. ii. 450 (1858).
Sphærium occidentale, PRIME, Proc. Acad. xi. 295 (1860), xiii. 407.

Shell small, pellucid, fragile, transparent, equilateral, somewhat elongated, not much inflated, outline of the valves oval; beaks small, rounded, not prominent; lines of growth fine and regular; color in some a light yellow, in others greenish yellow; hinge-margin very gently rounded; teeth very diminutive, laterals more distinct. Length, one third of an inch; breadth, three sixteenths of an inch; height, one fourth of an inch.

Fig. 414.

S. occidentale. Enlarged.

Found in Vermont, not uncommon.

I have not seen this shell, and derive the description from Mr. Prime. It is said to be remarkable for its completely oval shape. It is smaller, the margins more rounded, and the beaks not so much raised, as in *S. partumeium.*

There are some other species indicated as found within our limits, but the shells alluded to are not known to me.

Genus PISIDIUM, Pfeiffer. 1821.

Shell sub-oval, inequipartite, teeth small, one on the right and two on the left valve, marginal teeth long, two in the right valve. Mantle of animal open in front, uniting behind to form a short simple siphon; foot vermiform, expanding into a disk on which to crawl.

Pisidium dubium.

Fig. 56.

Shell oblique, triangular-ovate, pale-olivaceous, with fine concentric ridges; beaks but slightly elevated; teeth strong, white.

Cyclas dubia, Say, Nicholson's Encyc. Amer. ed. iv. pl. 1, fig. 10 (1816). — Gould, Inv. Mass. 75, fig. 56. — De Kay, Nat. Hist. New York, 293, pl. 25. fig. 261.
Pisidium dubium, Gould, in Agassiz's Lake Superior, 245 (1850). — Prime, Bost. Journ. vi. 354 (1852), pl. 11, figs. 4, 5, 6 — Chénu, Man. de Conch. ii. 105, fig. 478.
Pisidium abruptum, Haldeman, Proc. Acad. Nat. Sc. i. 53.

Shell small, rather thick, triangular, with its corners rounded, shining; beaks at one end, very little elevated; hinge margin and short end straight, the two lines forming a right angle; base and the longer side regularly rounded; valves tumid, surface with minute, concentric wrinkles, which, towards the base, enlarge into obvious sharp folds; color a light olive, with darker zones, and a marginal border of yellowish; within bluish or greenish; teeth well developed. Length, one fourth of an inch; height, one fifth of an inch; breadth, three twentieths of an inch.

Fig. 415.

P. dubium. Enlarged.

Found in streams in Bristol County, and in ditches in the Cambridge meadows, in company with the last species (*Cyclas elegans*), and probably in all parts of the State. Lakes about Halifax (*Willis*); Ottawa, Montreal, Anticosti, and all Lower Canada (*Bell*); Connecticut (*Linsley*); Maryland (*Foreman*); New York (*Newcomb*, *Prime*, *Ingalls*); Wisconsin (*Anthony*).

Fig. 416.

P. dubium.

Here, again, we have a shell bearing a close resemblance to a Transatlantic species, the *C. obliqua* of Lamarck, *C. amnica* of some writers. The foreign shell, however, is somewhat longer, less inequipartite, and more oval, and the wrinkles are somewhat more conspicuous. The young shells of our species have the beaks more removed towards the centre, and the

short side more rounded, so as to be scarcely distinguishable from the European species. In general appearance it is very like *Nucula tenuis*.

Pisidium Adamsii.*

Cyclas nitida, MIGHELS, Bost. Journ. Nat. Hist. iv. 39, pl. 4, fig. 3 (1842); Pr. 1, 48 (1841).

Pisidium Adamsii, PRIME, in STIMPSON'S Shells of New England, 16 (1851); Bost. Journ. Nat. Hist. vi. 352; Ann. of Lyceum, vii. 95.

Shell sub-ovate, full, oblique, inequilateral; anterior side a little longer, narrower, slightly produced at end; posterior side broader, somewhat sub-truncate at end, basal margin rounded; beaks small, a little raised, approximate at apex; surface smooth, striæ very delicate; color light gray, interior whitish; hinge margin curved; cardinal teeth very small; lateral teeth very distinct. Length, three tenths of an inch; breadth, twenty-four hundredths of an inch; width (height), two tenths of an inch.

Fig. 417.

P. Adamsii. Enlarged.

North America, at Norway in the State of Maine, and at Holly, Oakland County, Michigan.

A rare species. I have never seen any specimens but those in the collection of the Boston Society and those in my own, all of which came from Professor Adams, who discovered it with Dr. Mighels. The young is elliptical, obliquely striate, and compressed. The so-called *Cyclas nitida*, from Connecticut and New Hampshire, is *P. variabile*.

Fig. 418.

P. Adamsii.

Compared with *P. variabile*, this species is larger, comparatively more delicate, less oblique, less heavily striated, of a lighter color. It is much more oblique and less elongated than *P. abditum*. It is more oblique, and more inflated than *P. virginicum;* it is also more delicate than that species (*Prime*).

Pisidium compressum.*

Pisidium compressum, PRIME, Proc. Bost. Soc. Nat. Hist. iv. 164 (1852); Ann. N. Y. Lyceum, v. 219, pl. 6; vii. 97; Bost. Journ. Nat. Hist. vi. 356.

Cyclas altilis, ANTHONY, in litt. 1847.

Pisidium compressum, PRIME, Bost. Proc. iv. 164 (1851).

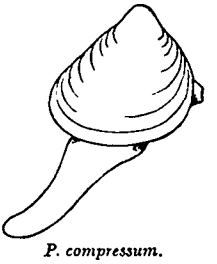
Pisidium altile, ANTHONY, PRIME, Bost Journ. vi. 353 (1852), pl. xi. figs. 10–12.

* See note, page 107.

Pisidium cicer, PRIME, Ann. N. Y. Lyc. vi. 65 (1853), pl. 1, fig. 1.
Pisum compressum, DESHAYES, Biv. Brit. Mus. 282 (1854).
Pisum altile, DESHAYES, loc. sup. cit. 280 (1854).
Musculium compressum, ADAMS, Rec. Gen. ii. 451 (1858).
Musculium altile, ADAMS, loc. sup. cit. ii. 451 (1858).
Musculium cicer, ADAMS, loc sup. cit. ii. 451 (1858).
Pisum cicer, ADAMS, loc. sup. cit. ii. 660 (1858).

Shell solid, very oblique, trigonal, triangular, sub-equilateral, very much drawn up in the region of the beaks, inflated in adult; anterior side a little longer, narrower, produced at the end, posterior broader, sub-truncate; beaks placed a little posteriorly, small, raised, with a wing-shaped appendage on the summits, distant; striæ distinct, regular; epidermis very variable, yellow, gray or chestnut color; valves solid, varying in inflation, interior light blue; hinge thick; cardinal teeth small, robust, compressed, disposed in the shape of the letter V reversed; lateral teeth distinct, short, strong, placed at an obtuse angle with the hinge proper. Length, sixteen hundredths of an inch; breadth, fourteen hundredths of an inch; width, nine hundredths of an inch.

Fig. 419.



P. compressum.

North America, in New England, in the States of New York, Pennsylvania, Ohio, and California, and at Montreal and Quebec in Canada.

This species, though perfectly distinct and well characterized, is subject to much variation; its very oblique shape is constant; in fulness it is exposed to much change, some old specimens are remarkably obese; the young are generally more elongated and more compressed.

One of the peculiarities of this species, which, however, is at times wanting from abrasion or from other causes, is the very singular shape of the apex of the beaks, which assume the appearance of wings placed on the summit of the umbos.

Fig. 420.

P. compressum.

P. cicer, from Greenwich, which I place with this species, differs a little from the type of *P. compressum*, in being larger, more inflated; the beaks also are larger, and do not exhibit the winged appendage. *P. altile*, a mere variety, is more oblique than the type, and does not possess the appendage on the beaks. Both these varieties are darker in color than the true *P. compressum*.

* See note, page 107.

The foreign analogue, *P. conicum*, from France, is so closely allied to our species that it is with the greatest care only that they may be separated.

P. compressum is more trigonal and less inflated than *P. variabile;* it is more equilateral than either *P. virginicum*, *Adamsii*, or *abditum*, and more oblique and less equilateral than *P. æquilaterale.*

The animal is remarkable for its liveliness. It is found sparingly during the spring and not at all in winter. It inhabits both still and running water, and buries itself sometimes in the mud (*Prime*).

Pisidium æquilaterale.*

Pisidium æquilaterale, PRIME, Bost. Journ. Nat. Hist. vi. 366, pl. 12, figs. 23–25 (1852); Ann. N. Y. Lyc. vii. 98.

Shell small, stout, heavy, somewhat inflated, rhomboidal, subequilateral; posterior margin a little angular where it meets the basal margin; inferior and anterior margins slightly rounded; beaks central, large, prominent, rounded, not approximate; valves very solid, moderately convex, interior light blue; striæ fine, surface glossy, epidermis very variable in color, light yellow, greenish, or brown; hinge-margin curved, cardinal teeth small, lateral teeth strong, distinct. Length, fifteen hundredths of an inch; breadth, fourteen hundredths of an inch; width, one tenth of an inch.

Fig. 421.

P. æquilaterale. Enlarged.

North America, in the States of Maine, Massachusetts, and New York.

This species is remarkable for its solidity, and for its short and quadrangular form; the latter gives it somewhat the appearance of a *Sphærium;* it is the most equilateral *Pisidium* I know of.

Fig. 422.

P. æquilaterale.

Compared with *P. variabile*, to which at first sight it bears a general resemblance from the gloss and color of its epidermis, it differs from it very materially in not being at all oblique, and in being equilateral; it is also much less full. Somewhat rare. I discovered it in the spring of 1852, in a clay pit in the neighborhood of Augusta, Maine, in company with *P. compressum* (*Prime*).

* See note, page 107.

Pisidium ferrugineum.*

Pisidium ferrugineum, PRIME, Proc. Bost. Soc. Nat. Hist. iv. 162 (1852); Bost. Journ. Nat. Hist. vi. 362, pl. 12, figs. 8, 9, 10; Ann. N. Y. Lyc. vii 98.

Shell small, rounded-oval, globose, slightly inequilateral; anterior side somewhat produced; margins rounded; beaks tubercular at apex, very distant; surface smooth; epidermis light yellow; hinge-margin rounded; cardinal teeth large, separate, anterior tooth more prominent; lateral teeth distinct. Length, seventeen hundredths of an inch; breadth, thirteen hundredths of an inch; width, eleven hundredths of an inch.

Fig. 423.

P. ferrugineum. Enlarged.

North America, in the States of Maine and New York.

Fig. 424.

P. ferrugineum.

Remarkable for the elevation of its beaks, which stand forth on the upper portion of the shell in the shape of large tubercles, which are generally coated with some dark ferruginous substance. It differs from *P. abditum* in being smaller, more inflated, not so elongated, and more equilateral.

One of our most common species, found usually in company with *P. variabile* and *P. ventricosum* (*Prime*).

Pisidium abditum.*

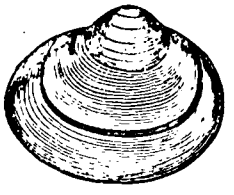
Pisidium abditum, HALDEMAN, Proc. Acad. Nat. Sc. Phila i. 53 (1841).
Cyclas minor, C. B. ADAMS, Bost. Proc. i. 48 (1841).
Pisidium tenellum, GOULD, Agassiz's Lake Superior 245, (1848).
Pisidium obscurum, PRIME, Bost. Proc. iv. 161 (1851).
Pisidium rubellum, PRIME, loc. sup. cit. iv. 163 (1851).
Pisidium minus, STIMPSON, Moll. New England, 16 (1851).
Pisidium Kurtzi, PRIME, Bost. Proc. iv. 162 (1851).
Pisidium zonatum, PRIME, loc. sup. cit. iv. 162 (1851).
Pisidium regulare, PRIME, Bost. Journ. vi. 363 (1852), pl. 12, figs. 11, 12.
Pisidium notatum, PRIME, loc. sup. cit. vi. 365 (1852), pl. 12, figs. 20–22.
Pisidium arcuatum, PRIME, loc. sup cit. vi. 364 (1852), pl. 12, figs. 14–16.
Pisum abditum, DESHAYES, Brit. Mus. Cat. 282 (1854).
Pisum minus, DESHAYES, loc. sup. cit. 281 (1854).
Pisidium resartum, INGALLS, in litt. 1855.
Pisidium rubrum, LEWIS, in litt. 1855.
Pisidium plenum, LEWIS, in litt. 1855.
Musculium abditum, ADAMS, Rec. Gen. ii. 451 (1858).
Musculium minus, ADAMS, loc. sup. cit. ii. 451 (1858).
Musculium rubellum, ADAMS, loc. sup. cit. ii. 452 (1858).

* See note, page 107.

Musculium obscurum, ADAMS, loc. sup. cit. ii. 452 (1858).
Musculium Kurtzi, ADAMS, loc. sup. cit. ii. 451 (1858).
Musculium zonatum, ADAMS, loc. sup. cit. ii. 452 (1858).
Pisum obscurum, ADAMS, loc. sup. cit. ii. 660 (1858).
Pisum Kurtzi, ADAMS, loc. sup. cit. ii. 660 (1858).
Pisum rubellum, ADAMS, loc. sup. cit. ii. 660 (1858).
Pisum zonatum, ADAMS, loc. sup. cit. ii. 660 (1858).
Pisidium retusum, PRIME, Proc. Zool. Soc. xxviii. 322 (1860).

Shell rounded-oval, elongated, very inequilateral, moderately convex, margins well rounded, beaks placed nearer the posterior side, small, slightly raised; surface smooth, striæ not distinct, epidermis variable, generally light straw-color; hinge-margin very nearly straight; cardinal teeth small, separate, the anterior tooth larger and more prominent; lateral teeth small, not much elongated. Length, fifteen hundredths of an inch; breadth, fourteen hundredths of an inch; width, nine hundredths of an inch.

Fig. 425.



P. abditum. Enlarged.

North America, in New England, in the States of New York, New Jersey, Pennsylvania, Ohio, Michigan, South Carolina, and California, in the Lake Superior region, at Montreal in Canada, and in Honduras.

This species is distributed over such a vast area of country, and varies so much according to the different localities in which it is found, that it is hardly surprising that its numerous varieties should have been mistaken for so many species. *P. casertanum*, its foreign analogue, to which it bears the closest resemblance, and from which it is very difficult to separate it, is likewise widely distributed and subject to much variation.

P. abditum is our most common species, and occurs generally in great numbers; its epidermis, though usually light yellow, is at times, according to the habitat of the shell, of a much darker color; the surface is at times also quite rough and the striæ are coarse.

Compared with *P. nov-eboracense*, to which it is nearly allied, it differs in being less heavy, more rounded, less full, the beaks are less large, the hinge-margin is straighter, the anterior extremity, which in the *P. nov-eboracense* forms a declivity from the beaks, is more regularly rounded, the distance from the beaks to the basal margin is less great, the exterior surface is much smoother, and the epidermis of a lighter color (*Prime*).

Fig. 426.

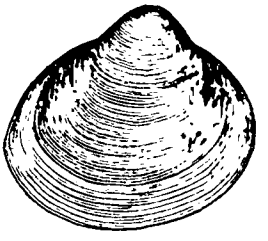
P. abditum.

Pisidium variabile.*

Cyclas nitida, MIGHELS, LINSLEY, Amer. Jour. xlviii. 276 (1845).
Pisidium variabile, PRIME, Bost. Proc. iv. 163 (1851).
Pisidium grande, WHITTEMORE, in litt. 1855.
Musculium variabile, ADAMS, Rec. Gen. ii. 452 (1858).
Pisum variabile, ADAMS, loc. sup. cit ii. 660 (1858).

Shell heavy, oblique, inequilateral, inflated; anterior side longer, narrower, somewhat angular at end; posterior subtruncate; beaks situated posteriorly, full, prominent, not approximate at apex; valves solid, interior light blue; striæ regular, but very distinct; epidermis glossy, very variable, straw-color or greenish-brown with a yellow zone on the basal margin; hinge-margin curved; hinge rather slight; cardinal teeth united, small; lateral teeth distinct, strong, short. Length, twenty-one hundredths of an inch; breadth, eighteen hundredths of an inch; width, seventeen hundredths of an inch.

Fig. 427.



P. variabile. Enlarged.

North America, in New England, and in the States of New York, Pennsylvania, and Virginia.

This species has hitherto always been looked upon by collectors as the *P. virginicum;* but having compared it with the original shells, described as *Cyclas dubia*, Say, by Dr. Gould, in his Report, and with some specimens of *P. virginicum* from Westfield, Massachusetts, sent to me by Professor C. B. Adams, as well as with some others sent to me from Philadelphia, by Professor S. S. Haldeman, I have become convinced that it is different from Say's shell. Compared with the young of *P. virginicum*, it is more oblique, less elongated, more inflated, and of a different color. This species is not so elongated as the *P. virginicum;* it is more inflated, the beaks are larger and more tumid; it is also a much smaller shell. Say describes *Cyclas dubia* as being six twentieths of an inch in length; *P. variabile* is only four twentieths of an inch in length, and that it is a full-grown shell I am led to believe, not only from its heavy striations and mature appearance in general, but also from having found young in the shell. The young is not so oblique as the adult; it is more elongated, less

Fig. 428.

P. variabile.

* See note, page 107.

inflated, and of a light yellow color. As a general rule, the coloring of this species varies much in different localities. The specimens collected from Rowley, Essex County, Massachusetts, are larger than any I have seen from other places; their color is also lighter. The animal is remarkable for its want of activity. This is one of our most common species, being found in nearly every stream, and at all seasons of the year, though most plentifully during the spring (*Prime*).

Pisidium ventricosum.*

Pisidium ventricosum, PRIME, Bost. Proc. iv. 68 (1851).
Musculium ventricosum, ADAMS, Rec. Gen. ii. 452 (1858).
Pisum ventricosum, ADAMS, loc. sup. cit. ii. 660 (1858).

Shell small, rounded-oval, globose, ventricose, somewhat oblique, slightly inequilateral, anterior side produced, posterior subtruncate; beaks small, protuberant, distant, situated towards the posterior side; surface smooth, yellow; hinge-margin curved; cardinal teeth separate; lateral teeth short. Length, eleven hundredths of an inch; breadth, ninety-five thousandths of an inch; width, eighty-five thousandths of an inch.

Fig. 429.

P. ventricosum. Enlarged.

North America, in the State of Massachusetts.

Fig. 430.

P. ventricosum.

This small, globose species is not likely to be confounded with any other but *P. rotundatum*, than which, however, it is more oblique, the margins are more abrupt, and the beaks more terminal and very much smaller. It is very nearly allied to *P. obtusale*, of Europe (*Prime*).

FAMILY CYPRINIDÆ.

SHELL equivalve, globose or rounded, with a triangular outline, more or less equilateral, solid, concentrically striated or furrowed, beaks twisted spirally or turned to one side; ligament mostly external, hinge short but strong, furnished with two or three cardinal teeth, besides laterals in each valve; pallial scar entire; muscular scars oval and usually very distinct.†

* See note, page 107.

† In this and other cases among the *Conchifera*, where I find no description of genus or family in Dr. Gould's MSS., I copy from Jeffreys. — W. G. B.

Genus ASTARTE, SOWERBY. 1816.

SHELL rounded, sub-equipartite, compressed, thick; hinge with two strong, diverging, cardinal teeth on one valve, and two very unequal ones on the other, or only one large one; pallial impression simple; ligament exterior.

Astarte castanea.

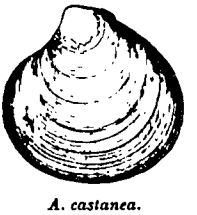
FIG. 44.

Shell sub-orbicular, with prominent and nearly central beaks; lunule deeply excavated; surface very slightly waved, covered with a chestnut-brown epidermis; margin crenulated within.

Venus castanea, SAY, Journ. Acad. Nat. Sc. ii. 273 (Aug. 1822).
Astarte castanea, SAY, Amer. Conch. pl. 1. — TOTTEN, Silliman's Journ. xxviii. fig. 2. — DE KAY, Nat. Hist. New York, 220, pl. 28, fig. 280. — PHILIPPI, Abbild. t. 5, fig. 2. — CONRAD, Amer. Mar. Conch. t. 17, fig. 45. — HANLEY, Rec. Sh. Suppl. t. 9, fig. 27. — PHILIPPI, Abbild. ii. 57 (*Astarte*), t. 1, fig. 2. — FORBES and HANL. Br. Moll. i. 470. — GRAY, Cat. Br. Mus. (Br. Moll.) 162.
Crassina castanea, LAM. An. sans Vert. 2d ed. vi. 258. — HANLEY, Recent Shells, i. 88.
Venus sulcata, MONTAGU, Test. Brit. 131. — MATON and RACKETT, Lin. Trans. viii. 81, t. 2, fig. 2.
Crassina sulcata, BROWN, Ill. Conch. 96, t. 38, fig. 10.

Shell thick and ponderous, sub-orbicular, or sub-triangular, the beaks nearly central, and much elevated, generally eroded; the areola in front of the beaks is ovate-lanceolate, short, broad, deeply excavated, very smooth, and darker colored; posterior slope nearly straight, with a long, narrow, lanceolate depression; basal margin regularly rounded, thick; surface very slightly undulated at the stages of growth, covered with a thick, chestnut-colored epidermis, wrinkled and stained with black posteriorly, with alternately paler and darker zones; ligament small and feeble. Hinge very strong, the hinge-margin very broad, bearing on the right valve one stout tooth, with a pit on each side; on the left valve two teeth somewhat diverging, with a deep pit between them for the reception of the opposite tooth; cavity small; muscular impressions deep, elongated, united by a direct pallial impression; margin in adult shells regularly crenulated. Length, one inch; height, one inch; breadth, eleven twentieths of an inch.

Fig. 431.



A. castanea.

Found abundantly in Provincetown Harbor, west and north of the light-house, at low-water mark. [Forbes asserts that *Astarte* is never a littoral shell.] Occasionally, specimens are picked up on Chelsea Beach; Nahant Beach, after storms (*Haskell*); Vineyard Sound, eight to twelve fathoms (*Desor*); dredged in Boston Harbor (*Stimpson*); Halifax Harbor and Sable Island (*Willis*). It is more abundant along the coast of the Middle States.

The foot of the animal is of a bright vermilion color, and when seen protruded, one would hardly persuade himself that a red wafer was not embraced by the valves.

This shell appears to be a well-characterized species, quite distinct from any species inhabiting the British coast. The species most nearly allied to it is *Venus* (*Astarte*) *compressa*, of Montagu.

Its remarkable points are, its height being usually greater than its length, its prominent central beaks curved so as to give the shell a somewhat kidney-shaped appearance, the broad, excavated lunule before them, and the smooth, chestnut-colored surface. The blackening of the posterior region of the shell is very peculiar. Some specimens look as if this portion had been dipped in tar.

The varieties in form and coloring are very numerous; one or two of which may be designated.

Var. *A. picea* is large and solid, surface with a few wrinkles without waves, and the epidermis of a dark tar-color. All the specimens I have found upon Chelsea Beach are of this variety. In specimens found about Sandy Hook, New York Harbor, the epidermis partakes of this dark appearance, about the color of Mr. Say's figure in the "American Conchology," though the surface is undulated. Hence I infer that the oceanic specimens are of the dark variety, while those which lie in quiet, sandy localities, like Provincetown Harbor, have rather a brownish-yellow color. In proportions it agrees with the type specimens.

Var. *A. procera*, inhabits Provincetown Harbor, and is fully described and figured by Colonel Totten in "Silliman's Journal," as a probable variety of *A. castanea*, but as possibly a distinct species. Its variation consists in its very light-colored epidermis, and the great elevation of its beaks. The color of all the shells in that harbor is remarkably light, as is noted of *Mactra solidissima* and *Mya arenaria*, so that in regard to its color it is merely a local distinction. The elevation of some of the specimens is remarkable; but these are found living intermingled with those of the normal form, and of every intervening degree of elevation. The shell in all its varie-

ties, but in this variety particularly, strongly reminds one of the termination of the recurved, round-pointed table or fruit knife. The foot of the animal has the same vermilion color; and, on the whole, this must be regarded as merely a variety. The proportions of the most elevated specimen figured by Colonel Totten are: length, four fifths of an inch; height, one inch; width, one fourth of an inch.

Astarte sulcata.

FIG. 46.

Shell ovate-triangular, the surface with deep, concentric furrows and ribs, vanishing at the extremities; beaks prominent; lunule and corselet long, narrow, and deeply excavated.

Pectunculus sulcatus, DA COSTA, Brit. Conch. 192 (1778).

Venus sulcata, MONTAGU, Test. Brit. 131 (1803). — PENNANT, Brit. Zool. iv. 203. — MATON and RACKETT, Lin. Trans. viii. 81, pl. 2, fig. 1. — DILLWYN, Catal. i. 167. — TURTON, Conch. Dict. 235.

Astarte sulcata, FLEM. Brit. Anim. 439. — REEVE, Elem. Conch. ii. 114, fig. 186. — ADAMS, Gen. ii. 483, pl. 115, fig. 6. — DE KAY, Nat. Hist. New York, 221, pl. 28, fig. 281. — FORBES and HANLEY, Brit. Moll. i. 452, pl. 30, figs. 5, 6; pl. 133, fig. 4; pl. M, fig. 5 (animal). — SOWERBY, Thes. Conch. ii. 778, pl. 167, figs. 1, 2, 3. — PHILIPPI, Abbild. ii. 56 (*Astarte*), t. 1, fig. 4. — GRAY, Brit. Mus. Cat. (Mollusca) 91.

Venus Danmonia, MONTAGU, Test. Brit. Suppl. 45, t. 29, fig. 4 (1808). — PENNANT, Brit. Zool. iv. 212. — WOOD, Index, pl. 7, fig. 21. — DILLWYN, Catal. 167.

Venus Danmoniensis, BLAINV. Malacol. 557, pl. 75, fig. 7.

Crassina sulcata, TURTON, Brit. Biv. 131, pl. 11, figs. 1, 2.

Crassina Danmoniensis, LAM. An. sans Vert. 2d ed. vi. 257. — DESHAYES, Encyc. Méth. Vers, i. 77. — CHENU, Man. de Conch. ii. 130, fig. 616.

Astarte Danmoniensis, SOWERBY, Genera, figs. 1–3; Conch. Man. fig. 110. — TOTTEN, Silliman's Journ. xxviii. 349, fig. 3. — LOVÈN, Ind. Moll. 36, 272. — FLEM. Br. An. 440. — REEVE, Conch. Syst. t. 66, figs. 1–3.

Venus Scotica, MONTAGU, Test. Brit. Suppl. 44 (the young). — MATON and RACKETT, Lin. Trans. viii. 81, pl. 2, fig. 3. — TURTON, Conch. Dict. 236. — WOOD, Index, pl. 7, fig. 20. — LAM. 2d ed. vi. 360.

Astarte Scotica, FLEM. Br. An. 44. — LOVÈN, Ind. Moll. Scand. 36. — PHILIPPI, Abbild. ii. 56 (*Astarte*), t. 1, fig. 3.

Crassina Scotica, LEACH, in Ross's Voy. 175. — TURT. Br. Biv. 130, pl. 11, figs. 3, 4. — BROWN, Ill. pl. 18, fig. 9; 2d ed. 95, pl. 38, fig. 9. — HANLEY, Recent Shells, i. 87.

Shell sub-orbicular, in some specimens approaching to ovate, in others to triangular, thick and strong, somewhat compressed; inequipartite, the anterior slope shortest and concave, bearing a long, lanceolate, deeply excavated, smooth lunule; posterior slope a straight line, usually rounded, but sometimes a little truncated at the hinder end, and including a very long, triangularly excavated corselet; beaks moderately elevated, pointed, and coming in contact; surface undulated with ten to twenty strongly developed con-

centric furrows and ridges, the depressed portions wider than the raised ones, vanishing at both ends, covered with a thick, greenish-yellow or glossy, brownish-olive epidermis. Hinge-margin strong, two teeth in the left valve and one in the right; interior polished, bluish-white; muscular impressions distinct. Length, one inch; height, one and one fourth inches; breadth, three fifths of an inch.

Fig. 432.

A. sulcata.

Dredged alive near Governor's Island, in four fathoms (*Stimpson*); Marblehead Harbor, at half-tide (*Haskell*); Halifax (*Willis*); Eastport, numerous and many varieties (*Cooper*). It is the most common species throughout all the Northern seas. Fossil in Labrador and about the Gulf of St. Lawrence (*Dawson, Bell*).

Very small and half-grown shells are not uncommonly found in the fish of Massachusetts Bay. It has been found by dredging in Newport and Portland Harbors; and occasionally a full-grown specimen is thrown up, with sea-weed attached, on our beaches. I have no doubt it would be found in many places by dredging. Along the coast of Maine it is common. At Augusta, Maine, Dr. C. T. Jackson found it plentifully in a partially fossilized state, and in company with other shells, such as are now common on the coast of Maine, imbedded in the earth many feet above high-water mark, showing conclusively that that region has, by some cause, been recently elevated above its former level.

This shell seems to have caused much perplexity to all who have undertaken to describe it. It is quite uncertain how many real species are embraced in the above synonymes. The discrepancy of authors, and the variety in the form and sculpture of the shells, which must come under one or the other of the names, leaves us in doubt. I have thought best to present them as one, and to include them under the name which seems most appropriate of the three. For, in the first place, the *Venus Scotica* and *V. Danmonia* of Montagu are clearly the immature and mature of the same shell; the distinctive mark which he gives, viz. the smooth margin of the first, and the crenulated one of the latter, being an insufficient one. He says: "The construction of the margin must be considered as inviolable; no common shell whose character is to possess a plain margin is ever found with a crenulated one, or *vice versa*." Now, it is perfectly certain that no species of the genus is found with a crenulated

margin, until the shell has arrived at its full dimensions, and the margin of the valves begins to thicken, as it always does; and then, so far as my observation goes, there is *always* a crenulated margin; so that this is merely a mark of maturity.

In the next place, Turton and others, with apparently good reasons, conclude that the *sulcata* and the *Danmonia* are the same. It is certain that Montagu's figure of *Danmonia*, and Turton's of *sulcata*, in his "British Bivalves," represent precisely the same shell. Turton, however, has fallen into Montagu's error of making two species, the *Scotica* and *sulcata*, which he says are precisely alike in all respects except the margin. Both the figures accurately represent one of the forms found on our coast, and that which might be regarded as the intermediate form.

Two pretty well marked groups of this furrowed species may be made out. One in which the shells are somewhat elongated, and pointed posteriorly, of an oval shape, undulations about fifteen, and very strongly marked, epidermis very dark greenish-yellow. Some of them are quite inequipartite, and occasionally the undulations vanish not far below the summit, and the remainder of the surface is merely wrinkled. These do not correspond with any British shells or figures I have seen. They may possibly prove to be distinct; and, if so, I would name them *A. undata*.

In the other group the shell is rounded, the beaks nearly central, broad posteriorly, and usually a little blunted or truncated at the point; the undulations are much more numerous, twenty and upwards, and of course more crowded; the epidermis is dark yellowish-brown, or piceous. These I regard as the true *A. Danmoniensis*. They agree with the figures of Montagu and Turton, and with the outlines given by Colonel Totten.

Astarte semisulcata.

Fig. 47.

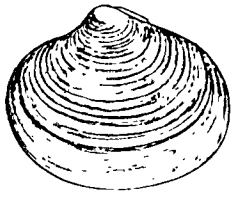
Shell sub-orbicular, compressed, concentrically wrinkled, epidermis yellowish-brown; an obsolete marginal tooth in each valve; margin plain.

Crassina semisulcata, Leach, in Ross's Voy. Append. 175.
Astarte arctica, Forbes and Hanl. Br. Moll. i. 461, t. 30, fig. 7. — Sowerby, Thes. Conch. ii. 780, t. 67, figs. 17, 18, 20.
Astarte semisulcata, Gray, Cat. Br. M. (Br. Biv.) 92.
Crassina arctica, Gray, Append. to Parry's Voy. — Hanley, Recent Shells, i. 88.
Astarte borealis, Philippi, Abbild. ii. 58 (*Astarte*), t. 1, fig. 11. — McAnd. and Forbes, Ann. Nat. Hist. xix. 98 (1847). — Forbes, Mem. Geol. Survey, i. 412.

Venus borealis, CHEMN. Conch. vii. t. 39, fig. 412.
Crassina borealis, NILLS. Nov. Act. Holm. 188 (1822), t. 2, figs. 3, 4.
Astarte cyprinoides, DUVAL, Rev. Zool. 278 (1841). — HANLEY, Recent Shells, Suppl. t. 14, fig. 40.
Venus compressa, MONTAGU, Test. Br. Suppl. t. 26, fig. 1.
Astarte compressa, MCGILLIV. Moll. Aberd. 261. — THORPE, Br. Mar. Conch. 247.
Crassina compressa, BROWN, Ill. Conch. G. Br. 96, pl. 38, figs. 4, 5.
Crassina corrugata, BROWN, ibid. 96, t. 40. fig. 24.
Astarte corrugata, LOVÈN, Ind. Moll. Scand. 37.
Astarte lactea, GOULD, Inv. 1st. ed. 80, fig. 47.

Shell orbicular-elliptical, rather thin, much compressed; surface marked with rather remote, rounded, rib-like ridges, most conspicuous along the posterior slope of the disk; covered with a dark yellowish-brown epidermis; beaks nearly central, elevated and inclined forwards, with a short, lanceolate lunule in front, and a longer corselet behind, both of them deeply excavated; the anterior slope from the beaks is concave for a very short distance, the posterior is straight, and both extremities are broadly rounded, the anterior most so; ligament broad; hinge-margin narrow and rather feeble, and cardinal teeth slightly elevated; on one side is a tooth-like ridge along the margin, and on the other a groove to receive this ridge; in the right valve the groove is before, and the ridge behind the cardinal teeth; cavity of the valves rather shallow; muscular and pallial impressions rather indistinct, except in old specimens; the margin is sharp and not crenulated. Length, one and one tenth of an inch; height, one inch; breadth, two fifths of an inch; a large specimen, one and three fourths of an inch, one and three eighths of an inch, five eighths of an inch.

Fig. 433.



A. semisulcata.

This shell, from the cabinet of Colonel Totten, was brought from the Grand Bank. Of the two specimens, one is about half the size of the other. Nova Scotia (*Willis*); Port Foulke (*Hayes Coll.*).

The specimen from the Arctic Seas, figured in the "Appendix to Beechey's Voyage," is much larger than either of these.

It is distinguished from *A. sulcata* by its broadly rounded extremities, compressed form, delicate and short ridges, slender hinge, shorter impressions each side of the beak, and its probably plain margin.

[It differs from *A. lactea*, for which I mistook it in the former edition, in having the outline of its internal face almost precisely egg-shaped, except in young specimens, where there is a short and

slight anterior incurvation just in front of the beaks, so that the anterior end is broadly and uninterruptedly rounded; the interior is cretaceous, and the surface sometimes nearly smooth; at others having more or less remote rather large waves over some part of the disk; in *A. lactea* the shell is more solid, the anterior dorsal margin excavated so as to make the anterior end much more acute than the posterior; the beaks are elevated, the hinge very robust, the interior ivory-like (though a little bluish), more uniformly covered with finer ridges. It is sometimes rather tumid and again very much compressed. Very many forms occur, and, like Sowerby, one feels compelled to admit each one as a species, or unite them in one.

Astarte quadrans.

FIG. 48.

Shell triangular, slightly oblique, anterior part longest; surface smooth; epidermis yellowish-olive; hinge with a marginal tooth on the anterior margin.

Astarte quadrans, GOULD, Invert. 1st ed. 81. — SOWERBY, Thesaur. ii. 782, pl. 167, fig. 5. — STIMPSON, Shells of New England, 18.

Shell small, triangular, solid, nearly equipartite, dorsal margins bounded by straight lines, the anterior somewhat longer and more oblique than the posterior; basal edge very sharp and regularly rounded, so that the whole shell is nearly a quadrant; beaks pointed, and not inclined to either side, generally eroded; lunule lance-shaped, slightly impressed, and a broader and longer areola behind the beaks; surface smooth, very slightly wrinkled by the lines of growth; epidermis light yellowish-olive; interior glossy bluish-white; hinge-margin narrow, with a small lateral tooth on the left valve, about half-way along the anterior margin, and a groove to receive it on the right valve; muscular impressions rather shallow; inner margin not crenulated. Length, nine twentieths of an inch; height, eight twentieths of an inch; breadth, two twentieths of an inch.

Fig. 434.

A. quadrans.

Several specimens of this small and very distinct species have been furnished me for description by Dr. Prescott of Lynn, and by Dr. D. H. Storer of Boston. They were taken from the stomachs of fish caught in Massachusetts Bay. Laminarian and Coralline Zone, from Stonington to Casco Bay; on a stone, St. George's Bank (*Stimpson*); Eastport, one dead (*Cooper*); Salem Harbor, in four fathoms, white sand (*Wheatland* and *Stimpson*); Grand Manan, rarely (*Stimpson*).

Its triangular form, smooth, glossy surface, and more especially the small marginal tooth, at once distinguish it. In all our other species the anterior margin is shortest and concave, and the lunule deeply excavated; but in this the posterior and anterior slopes are equally direct from the very summit.

It must be very closely assimilated to the *Venus triangularis* of Montagu, the *Cyprina triangularis* of Turton, in his "British Bivalves." But I cannot make out the requisite number of teeth to bring it within the genus *Cyprina*, or to correspond with their descriptions. A hasty observer might confound it with the young of *Cyprina Islandica*, which is more rounded and rough.

The existence of a marginal tooth would, literally, exclude the shell from this genus. But the general characters will bring it naturally into the same genus with *A. castanea* and *sulcata*. Moreover, a marginal tooth is more or less developed in individuals of all the species; and this only shows the close alliance of the genus to *Venus*, with which, indeed, Blainville unites it.

Astarte elliptica.

Shell elongated, elliptical, beaks moderately elevated, rather obtuse, sub-central; anterior margin excavated and forming a pretty distinct angle at its junction with the ventral margin, which is but gently curved; ligament margin nearly straight, descending very gently, end rounded; coarsely waved, the waves often disappearing below; hinge-margin delicate; interior a dead sub-livid color; margin simple, epidermis dark.

Crassina ovata, Brown (not Smith). Edinb. Nat. and Geog. Sc. i. 12, pl. 1, figs. 8, 9. — Brown, Ill. Conch. 96, pl. 38, figs. 12, 13.

Crassina sulcata, Nils. Nov. Act. Holm. 187 (1822), pl. 2, figs. 1, 2.

Crassina elliptica, Hanley, Recent Shells, Suppl. pl. 14, fig. 36. — Thorpe, Br. Mar. Conch. 246, fig. 107. — Brown, Conch. Ill. 96, pl. 38, fig. 3.

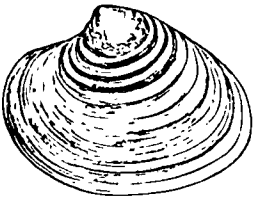
Astarte elliptica, McGilliv. Moll. Aberd. 259. — Gray, Cat. Br. Mus. (Br. Moll.) 92. — Forbes and Hanl. Br. Moll. i. 459, pl. 30, fig. 8.

Astarte semisulcata (not Leach), Möll. Ind. Moll. Grœnl. 19. — Philippi, Abbild. ii. 57 (*Astarte*), pl. 1, fig. 10 — Lovèn, Ind. Moll. Scand. 37.

Shell in most respects like *A. sulcata*. Its form is more elongated, and of an elliptical rather than triangular outline, though somewhat angular on account of the beaks and the slight excavation of the anterior slope; the beaks are a little in front of the middle, and rather obtuse, being quite tumid and not compressed near the apex; the hinge slope is much less rapid, in fact nearly horizontal; the hinder end is well rounded, rarely acute or truncate; dorsal excavations deep; epidermis yellowish-brown (young)

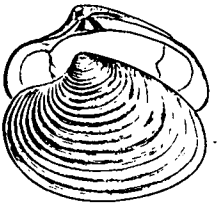
or pitchy; concentric waves not numerous (about twenty), large except on the beaks, recurved, and often quite wanting near the ventral margin, and along the posterior slope; this absence of folds is

Fig. 435.



A. elliptica.

Fig. 436.



A. elliptica.

often quite remarkable, even in young shells. Fine concentric lines are generally found on both ribs and interspaces. The hinge-margin is quite narrow and delicate, as the beaks do not rise to a point so as to form a large triangular area for the hinge, and the teeth are by no means conspicuous and robust; color of interior a dead livid or leaden color; muscular and pallial impressions large and deep; inner margin always simple.

Fig. 437.

A. elliptica. Young.

The elongated, elliptical form, usual disappearance of waves near the ventral margin and rear, delicate hinge and hinge-margin, dingy-white or livid interior, and simple inner margin at the most antiquated stages, are quite enough to determine the specific value of this shell.

Astarte Banksii.

Shell small, elevated, heart-shaped, tumid; beaks acute, anterior margin excavated, lunule deep and broad, surface with crowded, well-defined waves, inner margin smooth.

Astarte Banksii, Leach, in Ross's Voy. Appendix. — Gray, Zool. Beechey's Voy. pl. 44, fig. 10. — Sowerby, Thes. Conch. ii. 782, pl. 167, fig. 8.

Shell quite small, ovate-triangular or obliquely heart-shaped, tumid; beaks nearly median, prominent, acute, pointing forwards, the lunule broad and deeply excavated; anterior dorsal slope concave, sometimes remarkably so, rendering the anterior portion much less elevated and smaller than the posterior, and forming an angle as it joins the well-rounded end, which curve passes into that of the gently curved base; posterior dorsal margin always very slightly swelling, though nearly direct, but rapidly de-

Fig. 438.

A. Banksii.

scending, so that the posterior end is rather acute, though often slightly truncate, and sometimes very much so; concentric waves distinct, numerous (thirty to forty), sometimes wanting near the base; epidermis dark chestnut-brown, slightly mottled. Interior disk chalky, the limbus greenish or livid; impressions not strongly marked; hinge not greatly developed, though the lateral plaits are quite conspicuous; margin simple in all stages.

It may be somewhat difficult to define this species in such terms as to enable us to decide whether any single specimen may be this or its close ally *A. compressa*.* By comparison it is darker (not yellowish-green), has a less rounded outline on account of the more deeply concave anterior border, and thus more seemingly elevated beaks, and the more rounded posterior and terminal margin; the number of waves in the same space is about as two to three; the interior of *A. compressa* is by no means so chalky or so leaden, and the cavity of the beaks is less profound. The more lenticular form of *A. compressa* is best seen by inspecting the interior margin. In fact, in this respect the two species stand in much the same relation to each other as *A. sulcata* and *A. elliptica*. I have seen no shells from our coast which I should consider as *A. compressa*, though some have received that name; probably not being discriminated from this species, or being the young of some of the other finely waved forms. But as locality North or South evidently makes a marked difference in the color, form, and undulations of all species, we cannot be altogether positive on this point.

Fig. 439.

A. compressa.

Astarte crebricostata.

Shell rounded, ovate-triangular, rather compressed, with numerous squared ribs more or less obsolete behind and below; margin finely crenulate.

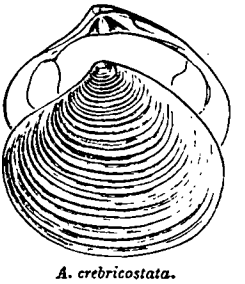
Astarte crebricostata, Forbes, Ann Nat. Hist. xix. 98, pl. 9, fig. 4. — Forbes and Hanley, Br. Moll. i. 456, pl. 30, fig. 9. — Möller, Moll. Grœnl. 19.

Shell rather large, moderately convex or compressed, beaks slightly anterior, rather obtuse, ovate-triangular, anterior slope faintly concave, posterior scarcely curved, the hinder end being rather obtusely rounded, with every degree of truncation in other specimens; concentric ribs very numerous (thirty to forty), the intervening grooves deep and squared, generally covering the shell,

* Figure 439 was prepared by Dr. Gould, evidently for the sake of comparison. I do not know from what locality the shell came. — W. G. B.

but sometimes fading out on the ventral half, with every intermediate degree, and rarely extending to the posterior end except about the beaks, where they are very crowded and complete; epidermis rusty-brown. Interior milk-white; hinge moderately developed; edge in adults very finely crenate. Length, one and one tenth inches; breadth, one inch.

Fig. 440.



A. crebricostata.

Found at Eastport, and at Anticosti Island (*Stimpson*); Dauphin Harbor, Labrador (*Packard*); young specimens in abundance, Halifax (*Willis*).

In the way of form there is nothing to distinguish this species from others. It undergoes all the variations of altitude and elongation, of acumination and truncation, inflation and compression, that are observed in others. Its leading character seems to be its very numerous waves, always conspicuous about the beaks, but often disappearing in the later stages of growth. A series of the young may be selected which would satisfy any one as to specific value; while intermediate specimens would so connect it with *A. sulcata*, *elliptica*, *Banksii*, and *compressa* as to be a complete puzzle. A large compressed form, to which I notice that Dr. Stimpson has attached a label in his collection with the name *A. lens*, I think would fall under this species, though it merges almost as well into *A. sulcata*. The specimens originally described were found in very deep water, only single valves, and in an eroded, chalky, half-fossilized condition. I have a single valve from Professor Mörch, said to have come from Iceland, which corresponds more with the lenticular form last mentioned than the more rounded and tumid sent by Mr. McAndrew. If it is to be regarded as a species it is evidently a Cisatlantic shell, only found astray on the other side.

A. pulchella, Jonas, of which I have seen an authentic specimen from Spitzbergen, appears to be an elongated, closely striated form, such as I have seen mingled with young specimens of the shell under consideration.

Astarte Portlandica.

Shell small, ovate-triangular, beaks elevated at the posterior third, ends rounded, margins simple, surface nearly smooth, interior livid.

Astarte Portlandica, Mighels, Bost. Journ. Nat. Hist. iv. 320, 345, pl. 16, fig. 2. — Stimpson, Shells of New England, 18.

Shell small, solid, ovate-triangular or broad kidney-shaped, the anterior portion being somewhat recurved; beaks acute and elevated, close upon each other, placed at the posterior third; posterior margin convex and sweeping regularly into the ventral margin, which is semicircular; anterior margin concave, but, passing into the ventral margin, forms a well-rounded end, so that the anterior portion is considerably less elevated than the posterior; lunule narrow, elongated, shallow; surface smooth with the exception of fine incremental striæ, which under a magnifier appear rather coarse and broken; epidermis yellowish-brown; interior smooth, dark-brown, inclining to chocolate color. Hinge-margin thin, the posterior margin of the left valve being sharp a little behind the beak, and received into a corresponding groove in the right valve; margins internally simple. Length, two fifths of an inch; height, nine twentieths of an inch; breadth, one fifth of an inch.

Fig. 441.

A. Portlandica.

A single specimen was found in the stomach of a haddock, by Dr. Mighels, in 1842.

Genus GOULDIA, C. B. Adams. 1851.

Shell equivalve, trigonal or sub-trigonal, with concentric ridges or plates; lunule distinct; two cardinal teeth on one valve and only one on the other; two anterior marginal teeth on each valve; pallial impression simple or very slightly sinuate.

Gouldia mactracea.

Shell small, quadrant-shaped, anterior margin excavated, surface with fine concentric waves, and minute radiating lines between them.

Astarte mactracea, Linsley, Catal. Shells of Connecticut, in Sillim. Journ. xlviii. (name only). — Gould, in Sillim. Journ. Sc. (Sept. 1848) 233.

Shell small and solid, nearly quadrant-shaped; the apex acute, somewhat behind the centre, with a divergence of the anterior and posterior marginal slopes of nearly a right angle, the posterior and ventral margins regularly curved, while the anterior margin is nearly a right line (rather concave), so as to form an obtuse angle when it joins the ventral margin; lunule long and deeply excavated. The surface is undulated with about fourteen concentric, rib-like waves, and is marked between the ribs with very minute, regular, radiating

Fig. 442.

G. mactracea.

striæ. Color pale yellowish-green, with fine pencillings of dusky radiations. There is a remote lateral tooth on the anterior margin. Diameters, one fourth of an inch; width, one tenth of an inch.

This shell was described from a single valve found by Rev. James H. Linsley at Stonington, Connecticut, in the stomach of a haddock. New Bedford Harbor, in four fathoms gravel (*Prime* and *Stimpson*); on the coast of South Carolina (*Kurtz*), where it also occurs in post-pleiocene deposits. Its peculiar form, and the fine radiating striæ between the ribs, are peculiar.

Genus CYPRINA, Lam. 1818.

Shell obliquely heart-shaped, beaks prominent; hinge with three unequal, diverging cardinal teeth, and a remote marginal one; pallial impression simple.

Cyprina Islandica.

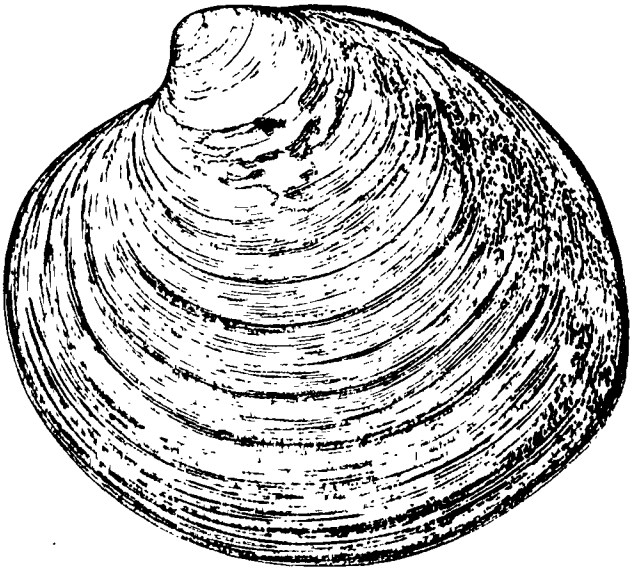
Shell ponderous, ventricose, round-ovate, inequipartite, shortest and compressed anteriorly; lunule none; epidermis chestnut-brown, thick, and coarsely wrinkled; edge simple.

Pectunculus maximus, Lister, Conch. t. 272, fig. 108.
Pectunculus crassus, Da Costa, Brit. Conch. 183, pl. 14, fig. 5.
Venus Islandica, Lin. Syst. Nat. 1131. — Gmélin, Syst. 3271. — Montagu, Test. Brit. 114. — Maton and Rackett, Lin. Trans. viii. 83. — Wood, in Lin. Trans. vi. t. 17, figs. 1, 2; Index Test. pl. 7, fig. 41; Dorset Catal. 35, pl. 6, fig. 5. — Dillwyn, Catal. i. 176. — Chemn. Conch. vi. 340, pl. 32, figs. 341, 342. — Donovan, Brit. Shells, iii. pl. 77. — Müller, Zool. Dan. i. 29, pl. 28, fig. 5. — Turton, Conch. Dict. 238. — Römer, Krit. Untersuch. 36.
Venus mercenaria, Pennant, Brit. Zool. iv. 94, pl. 53, fig. 47.
Venus bucardium, Born, Mus. pl. 4, fig. 11.
Cyprina Islandica, Lam. An. sans Vert. 2d ed. vi. 290. — Deshayes, Encyc. Méth. Vers, i. 46, pl. 272, fig. 6. — Blainv. Malacol. pl. 70 bis, fig. 5. — Turton, Brit. Biv. 135. — Fleming, Brit. Anim. 444. — Hanley, Recent Shells, i. 65. — Sowerby, Thes. Conch. i. pl. 168, figs. 1, 2, 3. — Forbes and Hanley, Br. Moll. i. 441, pl. 29, pl. M. fig. 4 (animal). — Lovèn, Ind. Moll. Sc. 38. — Crouch, Intr. Conch pl. 7, fig. 2. — Gray, Cat. Br. Mus. (Br. Moll.) 9. — Adams, Gen. ii. 444, pl. 110, figs. 4, 4 *a*. — Chenu, Man. Conch. ii. 103, figs. 458–460. — Küster, in Chemn. 2d ed. (*Venus*) pl. 5, figs. 1, 2. — Deshayes, Cat. Br. Mus. (Biv.) 200. — Reeve, Conch. Syst. pl. 65; Elem. Conch. ii. 114, fig. 190.
Cyprina vulgaris, Sowerby, Genera, pl. 38, fig. 11. — Brown, Conch. Ill. 93, pl. 31, fig. 1; Conch. Man. fig. 116. — Reeve, Conch. Syst. pl. 65.
Arctica vulgaris, Schum. Nouv. Syst. 145, pl. 13, fig. 3.
Cyprina arctica, Bowd. El. Conch. 11, fig. 33.

Shell large, thick, and heavy, ovate-orbicular, tumid; beaks elevated, pointed, turned forwards and inwards so as to come nearly

in contact; anterior part shorter, narrower, rounded and compressed; posterior part full and broad at the back, slightly angular at the extremity; a very superficial ridge passes from the beaks to the lowest posterior point; the space which they include is very coarsely wrinkled; there is a shallow oval pit before the beaks, but no distinctly marked lunule; the ligament is strong and protuberant; epidermis of a dark, shining, burnt-brown color, sometimes almost black, coarse and strong, rough with crowded and loose

Fig. 443.



C. Islandica.

wrinkles; hinge-margin broad and strong; cardinal teeth diverging, three in each valve, or rather one large double tooth and a small one in the right valve; marginal tooth slightly developed, blunt; inside chalky-white, muscular and pallial impressions superficial, the latter having no sinus; margin at base sharp and simple. Length, three and a half inches; height, three inches; breadth, one and three fourths of an inch.

This shell is an inhabitant of all the Northern Atlantic seas, especially near where some river empties into the ocean. It is sometimes thrown up from deep water upon our beaches in great numbers after storms. The young are found abundantly in the stomachs of fishes taken in Massachusetts Bay. It appears not to be common, if it is found at all, to the southward of Massachusetts.

It is one of our largest shells, and resembles no other shell of our coast except *Venus mercenaria*, with which it was confounded by Pennant. From this it is easily distinguished by its epidermis, and also by wanting the purple border along the interior margin of the shell.

It is subject to very little variety. Sometimes the surface has a series of concentric ridges, and sometimes the beaks are unnaturally elevated and curved. Old shells have a very dark epidermis, and are generally much decorticated. The young are of a light fawn-color, with darker and lighter zones, and the wrinkles, being much raised and very regular, give the surface a very pretty appearance. The rougher surface, greater proportionate length, rounded form, and want of a lunule, distinguish them from *Astarte quadrans*, of a similar size. From *Astarte elliptica* they differ little, externally.

They are obtained of every size, from one fourth of an inch to four inches in length.

Family VENERIDÆ.

Shell equivalve, triangular, rhomboidal, or globular; variously sculptured or almost smooth; beaks incurved, and turned towards the anterior side; ligament external, placed on the larger side of the shell; hinge strong, furnished with three or four cardinal teeth in each valve (one genus having two only in the left valve), some of which are cloven or double, and an obscure and ridge-like lateral tooth on the posterior side; pallial scar deeply sinuous; muscular scars oval and distinct.

Genus CYTHEREA, Lamarck. 1805.

Shell inequipartite, rounded; hinge with four diverging teeth in one valve, one of which is separate from the others, and three in the other valve; no lateral teeth.

Cytherea convexa.

Fig. 49.

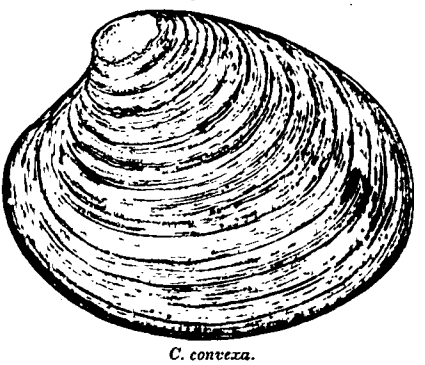
Shell oval, tumid; lunule heart-shaped; beaks prominent and recurved; color chalky white.

Cytherea convexa, Say, Journ. Acad. Nat. Sc. iv. 149 (1824), pl. 12, fig. 3; vi. 261. — Sowerby, Thes. Conch. (Cyth.) 638, pl. 132, fig. 119. — De Kay, Nat. Hist. New York, 216, pl. 27, fig. 279. — Hanley, in Wood's Index, Suppl. pl. 15, fig. 34. — Römer, Malac. Blatt. ix. 68.

Dione convexa, DESHAYES, Br. Mus. Cat. (Biv.) 71 (1853). — REEVE, Conch. Icon. pl. 10, fig. 40.
Cytherea Sayana, CONRAD, Sillim. Journ. xxiii. 345 (1833).

Shell oval, rather thin, valves very convex, color a dead-white or with a rusty tinge, usually chalky; inequipartite, beaks elevated, curving forwards, in front of which is a well-marked, heart-shaped lunule; anterior part about half the length of the posterior, compressed and somewhat pointed; regularly rounded behind and at base; surface marked with coarse lines of growth, which are most regular anteriorly; ligament long, rather sunken; within milk-white, polished; impressions superficial. Length, one and three fourths inches; height, one and one half inches; breadth, one inch nearly.

Fig 444.



C. convexa.

The animal has very long siphons, united throughout, translucent, with white blotches near the end, more opaque and brownish near the shell.

A few specimens have been found on Chelsea Beach, but it is rare. It has been found about Rhode Island by Colonel Totten; and it has also been taken with the dredge by Drs. Mighels and Wood of Portland, in the harbor of that place. Nahant Beach, alive, sometimes abundant; Marblehead Harbor, dredged in seven fathoms (*Haskell*); Sable Island and Halifax, rare (*Willis*).

Mr. Say knew it only as a fossil, in which state it occurs in the tertiary formation of Maryland.

This is by no means an attractive shell, its dead-white surface leading one to regard it as some beach-worn specimen of *Cyprina*, or perhaps of *Venus mercenaria*. Its form, however, is proportionally longer than the former, and somewhat longer than the latter; and it never attains to anything like the size of either of them. It belongs to the genus *Callista* of Poli.

Genus VENUS, LIN. 1758.

SHELL inequilateral, sub-ovate; hinge with three diverging cardinal teeth in each valve; pallial impression with a sinus.

Venus mercenaria.

FIG. 52.

Shell solid, obliquely ovate, very inequipartite; lunule heart-shaped; surface antiquated, bluish-white, with numerous, concentric laminated ridges; inner margin broadly edged with violet.

Pectunculus, LISTER, Conch. t. 271, fig. 107.

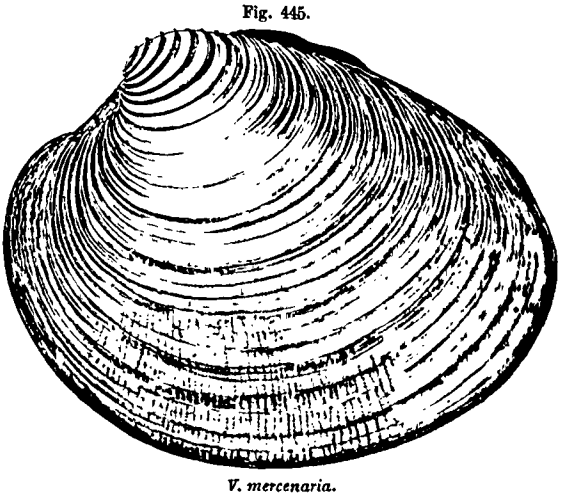
Venus mercenaria, LIN. Syst. Nat. 1131. — GMÉLIN, Syst. 3271. — CHEMN. Conch. x. 352, t. 171, figs. 1659, 1660. — DESHAYES, Encyc. Méth. Vers, iii. 1117, pl. 263, figs. 1–3. — LAM. An. sans Vert. 2d ed. vi. 346. — DILLWYN, Catal. i. 176. — WOOD, Index, pl. 7, fig. 40. — SOWERBY, Thes. ii. 733, pl. 162, figs. 204–206. — CHENU, Ill. Conch. pl. 8, fig. 5. — DE KAY, Nat. Hist. New York, 217, pl. 27, fig. 276. — HANLEY, Descr. Cat. 115. — REEVE, Conch. Icon. (*Venus*) pl. 2, figs. 4 *a*, *b*. — RÖMER, Krit. Untersuch. 36. — SCHUM. Nouv. Syst. 135, pl. 10, fig. 3.

Mercenaria violacea, SCHUM. (1817) Nouv. El. 135, pl. 10, fig. 3. — ADAMS, Gen. ii. 419, pl. 107, figs. 2, 2 *a*. — DESHAYES, Cat. Brit. Mus. (Biv.) 113.

Mercenaria mercenaria, CHENU, Man. de Conch. ii. 82, figs. 356–358 (1862).

Shell large, thick, and solid, obliquely ovate, or heart-shaped, tumid; exterior a dirty white and chalky; the beaks are placed far forwards, projecting nearly to the front of the shell; they are elevated, and curved so as to make nearly half a turn forwards and inwards; in front of them is a heart-shaped, rough lunule, bounded by an impressed line; behind the beaks the edge is very broad and obtuse, the ligament large and protuberant, with a space around it somewhat excavated, smoother than the rest, and bounded by an obtuse ridge; anterior end very short, round; posterior end terminating in a blunt, occasionally truncated point; looking at the side of the shell as it stands on this point, it is accurately heart-shaped; surface with concentric grooves and ridges, the ridges being crowded and rising into thin, sharp plates, most conspicuous at the ends; the central portion is

Fig. 445.



V. mercenaria.

nearly smooth. There are also minute lines, radiating from the beaks to the margin, most conspicuous on the beaks, where they form a lattice-work with the concentric lines; color a dirty white, except the smooth portion of the disk, which is dark violet; within pure white; muscular impressions deep, united by a well-marked pallial impression, which has an acute angled, not very deep sinus; the margin outside the impressions is more or less of a beautiful deep violet hue; basal and anterior margin crenulated. Length, three inches; height, two and a half inches; breadth, two inches.

Brought from Wellfleet and other towns on Cape Cod in considerable quantities to Boston market. It is found more abundantly at the South, and in New York and Philadelphia markets supersedes the use of the *Mya arenaria* almost entirely, while it may be found in greater or less abundance in all the region of Cape Cod, and scantily in all parts of Massachusetts Bay. Coast of Maine, far to the eastward of Portland (*Mighels*); Halifax, Sable Island, Prince Edward's Island, Fishing Banks (*Willis*); Gulf of St. Lawrence (*Logan*).

The shell is easily known by its size and weight, and by its heart-shaped form when resting upon its point. It is about the same size as *Cyprina Islandica*, from which it is distinguished by the sharp ridges on its surface, and by the want of an epidermis; also by the violet-colored border of the interior of the valves. This mark, however, is not constant. In young shells it is wanting, and also in very old shells the color is often obscured by a thick white glazing. Fishermen say that those found outside Cape Cod, in the region of Chatham, are always devoid of it. The shell has become quite famous from the fact that, from its purple edge, the aborigines manufactured their purple wampum; while the white wampum was made of various species of shells, but chiefly from the axis of *Pyrula*.

It is known in Massachusetts under the name of *Quahog*.* It is the clam of New York and Philadelphia. The upper outline of the figure (in the first edition) represents this shell.

* The following items relative to the derivation of this word, and the connection of this shell with aboriginal history, may be appropriately presented:—

"A piece of Poquahauges, a rare shell, and a dainty food with the Indians. The flesh eats like veal; the English make pyes thereof; and of the shells the Indians make money.

"Young Poquahauges, *Pectunculus fasciatus*.

"It is called Wampampeege."—*Governor Winthrop's Curiosities from New England, Journal of the Royal Society, June* 27, 1634.

"Called by some English *hens-poquahock;* three are equal to a penny; a fathom is worth five shillings."—*Roger Williams.*

"The quahaug (*Venus mercenaria*), called by Roger Williams the *poquau* and the *hen*, is

Venus notata.

FIG. 52.

Shell ovate-orbicular, inequipartite, posterior end truncated; surface with concentric sharp ridges, mostly wanting on the disk; color yellowish or grayish-white, and with fawn-colored zigzag markings; interior wholly white.

Venus notata, SAY, Journ. Acad. Nat. Sc. ii. 271 (1822); BINNEY'S reprint, 94. — GOULD, Inv. Mass. 1st ed. 87. — PHILIPPI, Abbild. (*Venus*) 128, pl. 2, fig. 3. — DE KAY, Nat. Hist. New York, 218, pl. 27, fig. 278.

Venus mercenaria, var. SOWERBY, Thes. 733, pl. 162, fig. 206. — REEVE, Conch. Icon. (*Venus*) pl. 2, fig. 4 *a*.

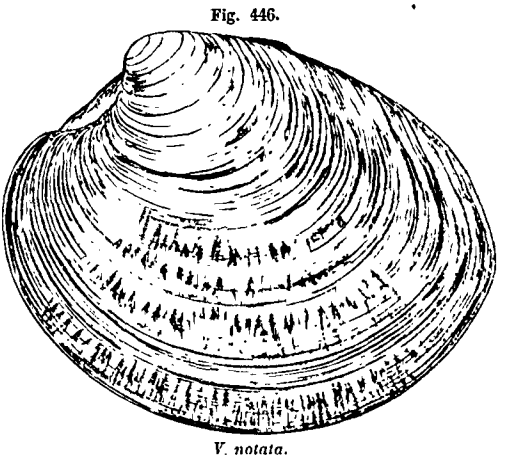
Mercenaria notata, DESHAYES, Br. Mus. Cat. Biv. Shells, 114 (1853).

Venus obliqua, ANTON, Wiegm. Archiv. 1837, and *V. Cyprinoides*, ANTON, Verzeich. (fide PHILIPPI).

Venus præparca, SAY, Journ. Ac. Nat. Sc. ii. 271 (1822); BINNEY'S reprint, 95. — DE KAY, Nat. Hist. New York, 219. — HANLEY (*V. notata*, var.), Descr. Cat. 117; in WOOD'S Suppl. pl. 13, fig. 41. — DESHAYES (*Mercenaria notata*), Cat. Br. Mus. (Biv.) 115.

Shell very similar to the preceding, and perhaps merely a local variety. The differences which I shall mention appear, however, to be constant. The shell is less heavy and coarse. The hinge slope declines less rapidly, so that the posterior side is broader, and its extremity broadly truncated; the area about the ligament is much more smooth, and usually colored brown or purplish. The concentric ridges are more regular in their distances, are somewhat undulated, and frequently are lost in each other; on the centre of the shell the ridges seem to

Fig. 446.



V. notata.

a round, thick shell-fish, or, to speak more properly, worm. It does not bury itself but a little way in the sand; is generally found lying on it, in deep water; and is gathered up by rakes made for the purpose. After the tide ebbs away, a few are picked up on the shore below high-water mark. The quahaug is not much inferior in relish to the oyster, but is less digestible. It is not eaten raw; but is cooked in various modes, being roasted in the shell, or opened and boiled, fried, or made into soups and pies. About half an inch of the inside of the shell is of a purple color. This the Indians broke off and converted into beads, named by them *suckauhock*, or black money; which was twice the value of their *wompom*, or white money, made of the *metauhock*, or periwinkle (*Pyrula*).

"*Poquahock*, corrupted into *quahaug* or *quauhog*, is the word with a plural termination." — *History of Orleans, in Collections of Mass. Hist. Society*, VIII. 192 (1802).

have been worn off, leaving the surface nearly smooth; there are no conspicuous radiating lines upon the beaks forming a lattice-work with the concentric ridges; but between the ridges are fine lines of growth. The surface is shining, not chalky, of a flesh-color, and with zigzag blotches of fawn-color or brown; these, however, are not always present. The interior is wholly of a yellowish white. The lower outline of the figure shows its form compared with *V. mercenaria*.

Venus præparca seems to me to be the same thing, in which merely the zigzag lines are wanting. Lives along the shores of Cape Cod.

Genus TAPES, Mühlfeldt. 1811.

Shell triangular or rhomboidal, rather solid, grooved concentrically but not deeply; lunule lanceolate or indistinct; teeth, three cardinals, which are erect and slender, and an obscure lateral (as in the other genera) in each valve; inside margin plain. Body oval or oblong; mantle having its edges plain; tubes more or less united; foot usually furnished with a byssal groove.

Tapes fluctuosa.

Fig. 50.

Shell transversely ovate, lenticular, white, with a yellowish epidermis; surface with recurved, concentric waves vanishing at the sides; areola none, or indistinct in old specimens.

Venus fluctuosa, Gould, Inv. Mass. 1st ed. 87. — De Kay, Nat. Hist. New York, 220. — Gray, Cat. Brit. Mus. (Biv.) 176. — Reeve, Conch. Icon. pl. 24, fig. 119 *b*.

Tapes fluctuosa, Deshayes, Cat. Br. Mus. (Biv.) 176; non T. f. — Sowerby, Thes. pl. 163, fig. 163.

Venus astartoides, Beck (1849), in Middend. Beitr. z. c. Mall. Ross. iii. 56; Siber. Reise, 92 (1851), pl. 20, figs. 7–13. — Sowerby, Thes. ii. 737, pl. 138, fig. 157.

Shell oblong-ovate, lenticular, rather thin, nearly equipartite; white, beneath a glossy, thin, straw-colored epidermis; anterior part shortest and broadest; both ends widely rounded; beaks slightly elevated, with a smooth, heart-shaped space before them, not distinctly defined by any boundary; surface with from twenty to twenty-five concentric waves, not quite extending to the margin, especially anteriorly, so that the marginal edges are plain; when closely examined, these waves or ridges are found to be compressed, thin, and inclined towards the beaks; cardinal teeth three in each valve, the middle one cleft in both valves; muscular and pallial impressions very superficial, the

Fig. 447.

T. fluctuosa.

latter with a small sinus. Length, four fifths of an inch; height, three fifths of an inch; breadth, nine fortieths of an inch. I have since seen a specimen one and one half by one and one eighth inches in length and height.

Of this shell I have three specimens, brought from the Bank fisheries. The largest is proportionally more convex than the others, and the ridges are less definite. Halifax and Fishing Banks (*Willis*); in the Copenhagen Museum, from Nahlsalik, Greenland (*Beck*).

I know of no species very closely approaching this. Most of those allied to it have the posterior extremity more or less angular; this is always accurately rounded. The ridges and grooves of the surface are like those of *V. papilionacea*. *Venus œnea* of Turton, small specimens of *V. gallina*, and of those Indian species allied to *V. papilionacea*, may be mentioned as allied to it.

Genus GEMMA, Deshayes. 1853.

Shell rounded, trigonal, beaks nearly central, three cardinal teeth in the left valve, the median one conic triangular and a little curved, in the right valve two diverging teeth with a wide interposed pit; pallial impression marginal, with a long, narrow, ascending sinus. Animal with siphons connate, the lower one longer and fringed, the upper one valvular; foot semilunar.

Gemma gemma.

Fig. 51.

Shell minute, nearly round and nearly equipartite, concentrically furrowed, violet and white, margin crenulate.

Venus gemma, Totten, Sillim. Journ. xxvi. 367, figs. 2, *a–d* (1834). — Gould, Inv. 88, fig. 51. — Sowerby, Thes. Conch. ii. 737, pl. 158, fig. 141. — Wood, Ind. Suppl. pl. 15, fig. 45. — De Kay, Nat. Hist. New York, 218, pl. 27, fig. 277. — Hanley, Descr. Cat. 126. — Stimpson, Shells of New Eng. 19. — Reeve, Conch. Icon. pl. 25, fig. 128.
Gemma Totteni, Stimpson, Check Lists (1860).
Gemma gemma, Chenu, Man. de Conch. ii. 83 (1862), fig. 359. — Adams, Gen. ii. 419, pl. 107, figs. 3, 3*a*. — Deshayes, Cat. Brit. Mus. (Biv.) 113 (1853).
Cyrena purpurea, H. C. Lea, Sillim. Journ. xlii. 106, pl. 1, fig. 1 (young).

Shell small, nearly orbicular, beaks nearly central, slightly elevated; generally eroded. No defined lunule in front of them; surface shining, with minute, concentric, crowded furrows; anterior portion, and mostly the base, white or tinged with rose-color; posterior and upper portion reddish-purple; within white, except poste-

riorly, where it has the purple color of the outside; muscular and pallial impressions distinctly marked, the latter with an acute sinus; teeth divergent, the middle one in each valve stout and triangular, the anterior tooth of the right, and the posterior one of the left valve thin, and not easily distinguished; inner margin crenulated. Length, three twentieths of an inch; height, one eighth of an inch; breadth, one sixteenth of an inch.

Fig. 448.

G. gemma. Enlarged.

This beautiful little amethystine gem, as it has been appropriately called, is found in great abundance on all the sandy shores of Massachusetts Bay. Colonel Totten also found it in Newport Harbor. Beyond this its range is not known. [Fishing Banks (*Willis*); Green Island (*Bell*).] It was noticed by some of the early visitors to New England, and specimens of it were sent home to England among other curiosities. It is, therefore, not a little remarkable, that a shell so long ago observed should have remained, until very lately, undescribed. But it is only recently that it has been recognized as a distinct species and described by Colonel Totten. It is commonly regarded as the fry of the *quahog* (*Venus mercenaria*), on account of its purple tip. But on close examination it will be found to be a fully developed, mature shell, different in every important particular from that species. It is a very interesting shell, as being by far the least of any species of the genus known.

Gemma Manhattensis.

Shell small, triangular, solid, shining, beaks nearly central, grooved with remote, concentric furrows, inner margin crenulated.

Venus (*Gemma*) *Manhattensis*, PRIME, Ann. New York Lyc. vii. 482 (woodcut) (1852).—JAY, Catal. 4th ed. Suppl. 466.

Fig. 449.

G. Manhattensis. Enlarged.

Shell quite small, elevated, nearly triangular, with the apex nearly central and the ventral margin rounded, the posterior end more rounded than the anterior; valves rather solid, compressed, of a straw color, shining, and very regularly furrowed with distinct concentric grooves. Interior white, the siphonal sinus very small, and the margin clearly crenulated; muscular impressions quite distinct. Length and height one eighth of an inch; breadth, one sixteenth of an inch.

Found in East River, New York, near Hell-Gate, by Mr. Prime, and by Mr. Sanderson Smith at Greenport, Long Island.

It is rather smaller, more triangular, more compressed, more deeply and regularly grooved, than *G. gemma*, and destitute of purple within and without.

Family CARDIADÆ.

Shell somewhat heart-shaped; cardinal teeth two or three; lateral teeth one or two; radiately ribbed or furrowed. Mantle open, siphons very short, foot very large and kneed.

Genus CARDIUM, Lin. 1758.

Shell somewhat heart-shaped; beaks prominent; margin generally toothed or folded within; hinge with two oblique cardinal and two marginal teeth in each valve; pallial impression without a sinus.

Cardium Islandicum.

Fig. 58.

Shell large, rounded-ovate, tumid, sub-equipartite, with about thirty-six sharp, three-sided ribs; epidermis lax, and rising into a fringe on the angle of the ribs.

Cardium Islandicum, Lin. Syst. Nat. 1124. — Chemn. vi. 200, t. 19, fig. 195. — Gmélin, Syst. 3252. — Brug. Encyc. Méth. 222. — Wood, Gen. Conch. 225, pl. 55, figs. 2, 3; Index, pl. 5, fig. 27. — Lister, Conch. t. 329, fig. 166. — Gualt, Test. t. 71, fig. M. — Knorr, Délices, &c. vi. t. 8, fig. 3. — Born, Mus. 49. — Sowerby, Conch. Ill. No. 194. — Middend. Beitr. z. Malac. Ross, iii. 38. — Stimpson, Shells of New England, 19; Inv. Gr. Manan, 21.

Cardium arcticum, Sowerby, Conch. Ill. fig. 26 (1841).

Cardium ciliatum, O. Fabr. Fauna Grœnl. 410 (1780). — Möller, Moll. Grœnl. 20.

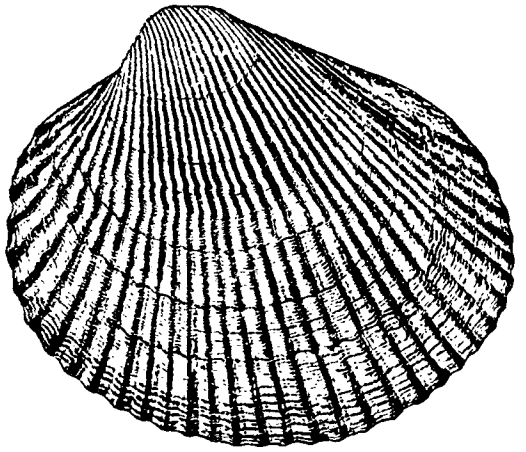
Cardium pubescens, Couthouy, Bost. Journ. Nat. Hist. ii. 60, pl. 3, fig. 6 (young).

Shell large, rather thin, nearly equipartite, a little obliquely rounded-ovate; tumid; anterior part shortest and narrowest, ends regularly rounded; beaks prominent, the points turned inwards, and nearly in contact; in front of them is a narrow, heart-shaped depression; on each valve are thirty-six, or more, three-sided, sharp-edged, radiating ribs, the furrows between them rounded, and regularly wrinkled by the lines of growth; epidermis yellowish-brown, lax, and bristling into a stiff fringe on the sharp edge of the ribs; within straw colored, the portions covered by the mantle pearly; grooves, answering to the ribs without, are obvious within, and the edges are strongly notched. Length, two inches; height, somewhat less; breadth, one inch.

Found plentifully in the stomachs of fish caught in Massachusetts Bay. Off Cape Cod in thirty-five fathoms (*Atwood*); dredged in Marblehead Harbor, seven fathoms (*Haskell*); young and dead shells, Grand Manan, common (*Stimpson*); Eastport (*Cooper*, *Stimpson*); Bedford Basin, Halifax (*Willis*); Bic and Ramouski, Gulf of St. Lawrence (*Bell*); Cape Hope, James's Bay, 52° 10′, dead (*Drexler Coll.*); Greenland (*Möller*); Mingan Island, twenty feet (*Packard*); Beechey Island (*Belcher*).

This shell seems not to have been hitherto described, in all its characters, by any one writer. English authors seem to have possessed superannuated specimens, which had lost the epidermis; and such we have long been in the habit of receiving from the Bank fishing-grounds. On the other hand, Mr. Couthouy, having only immature specimens, failed to trace their pedigree. Through the kindness of Dr. Storer, I have had an opportunity to examine specimens of Mr. Couthouy's *C. pubescens* of the size above indicated, taken in our bay, covered with their peculiar epidermis; under which disguise, however, it was not difficult to detect the *C. Islandicum*. A few years since I examined a denuded specimen, brought by Dr. C. T. Jackson from the coast of Maine, where he says they are not uncommon, measuring two and seven tenths inches in length, by two and four tenths in height. Those taken in Massachusetts Bay seldom exceed half an inch in diameter.

Fig. 450.



C. Islandicum.

Destitute of an epidermis, it looks much like *C. edule*, but is easily distinguished by the number of ribs. In two of my specimens there are thirty-eight ribs; in all the others there are thirty-six; *C. edule* has twenty-six. It is usually found in company with *C. pinnulatum*, and small specimens would not be readily discriminated from it. But, besides the greater number of ribs, its bristled

fringe upon the ribs, instead of little tubercles, marks it. It closely resembles *C. exiguum* also; but, among other obvious differences, that shell has an angulated form.

Cardium elegantulum.

Shell elongated oval, inequipartite, with twenty-six to twenty-eight ribs separated by deep, wide grooves and covered by arched bars.

Cardium elegantulum, Beck, in Mörch, Prod. Faun. Grœnl. 20 (1857).

Shell very small, elongated, ovate, rather compressed, anterior end rather sharply rounded, posterior end slightly truncated obliquely, posterior dorsal margin straight, a little sloping; beaks at the anterior third, acute, moderately elevated, inclined forwards, without a defined lunule in front; ribs twenty-six or twenty-eight, very strongly marked, the interspaces very deep and nearly as wide as the ribs, which are uniformly covered with closely imbricated arched bars extending quite across each rib; the two posterior ribs much broader than the others. Length, one fourth of an inch; height, one fifth of an inch; breadth, one eighth of an inch.

Fig. 451.

C. elegantulum.

Inhabits Greenland.

Easily distinguished from the last by its elongated form, smaller size, and ribs in high relief, covered with transverse bars.

Cardium pinnulatum.

Fig. 57.

Shell small, sub-orbicular, with a slight angle posteriorly, sub-equipartite; surface with twenty-six ribs, with a single range of arched scales upon each.

Cardium pinnulatum, Conrad, Journ. Acad. Nat. Sc. vi. 260, pl. 11, fig. 8 (1831). — De Kay, Nat. Hist. New York, 205, pl. 22, fig. 249. — Mighels, Shells of Maine, 16; Bost. Journ. Nat. Hist. iv. 321. — S. Smith, Shells of Long Island, Ann. New York Lyc. vii.

Shell very small, fragile, dingy white, nearly orbicular, somewhat oblong; nearly equipartite; beaks slightly elevated, inclined inwards; an obtuse not very obvious ridge passes from the beaks to the posterior point of the shell, rendering this side a little angular; the anterior area is shortest and regularly rounded; surface with about twenty-six slightly rounded ribs separated by a deep linear groove, on each of which is a series of equidistant, arched scales,

most conspicuous along the posterior slope, where they are sometimes folded so as to assume the form of spines; interior white or flesh-colored, sometimes with a brownish blotch at the posterior muscular impression; furrowed to correspond to the ribs without. Length, nine twentieths of an inch; height, four tenths of an inch; breadth, three tenths of an inch.

Fig. 452.

C. pinnulatum.

This very small and pretty species is as common as any other shell in the stomachs of fishes, and may be obtained from them at almost any time. Mr. Conrad obtained his specimens from Massachusetts, and I have never heard of it in any other locality.

Charles River, three to seven fathoms, gravelly bottom (*Stimpson*); Eastport, pretty common (*Cooper*); Halifax and Fishing Banks (*Willis*); Casco Bay (*Mighels*); Gardiner's Bay, Long Island (*S. Smith*).

It is usually accompanied by the young of *C. Islandicum*, from which it is distinguished by fewer ribs, and the scales crossing them. It is at first difficult to say that it is not identical with one of the small European species, which are scarcely distinguishable from each other by mere size and form, but require a careful examination of the sculpture in order to separate them. From *C. exiguum* it differs in not having a short, diminished anterior side, elevated beaks, and a very prominent ridge posteriorly, and especially in the absence of pits in the grooves. The whole aspect of that shell is angular, while our shell is scarcely at all so. It is still nearer to *C. fasciatum* and *C. nodosum*, agreeing most with the former in outline, and with the latter in sculpture. *C. fasciatum*, however, has mere points and not bars along the posterior ribs; and while the sculpture is almost precisely the same as that of *C. nodosum*, it is more broadly rounded anteriorly and less angular posteriorly, with a less strongly marked oblique ridge, so that on the whole it has a more rounded and lenticular form. In the young shell all the ribs are traversed by the transverse bars; but by age those on the disk become worn off, and they are only found on a few ribs at each end. The animal sometimes suspends itself by a thread, and can leap by its foot to a considerable distance.

Genus **LIOCARDIUM**, Mörch.

Shell longitudinally oval, inequilateral; surface of valves simple, neither ribbed nor spinous; hinder gape small.

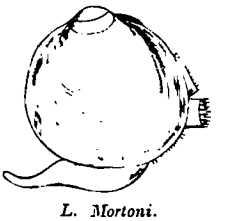
Liocardium Mortoni.

Shell small, thin, sub-globose, smooth, pale fawn-color, sometimes blotched with dark brown; within striated, bright yellow, with a purplish blotch posteriorly.

Cardium Mortoni, CONRAD, Journ. Acad. Nat. Sc. vi. 259, pl. 11, figs. 5, 6, 7 (1831); Sillim. Journ. xxiii. 346 (1833). — DE KAY, Nat. Hist. New York, 207, pl. 23, fig. 251. — STIMPSON, Shells of New England, 19. — SMITH, Moll. of Long Island, 16, and in Ann. New York Lyc. vii., and Sillim. Journ. xxvii. 283.
Liocardium Mortoni, STIMPSON, Check Lists, 2.

Shell small, thin, obliquely sub-ovate, sub-globose; beaks large and prominent, incurved, nearly central; posterior part a little produced and directed obliquely downwards; surface glossy, destitute of ribs or radiating lines, with fine lines of growth, and an occasional darker zone; color very pale yellowish, covered with a very thin, darker epidermis, thicker and more wrinkled behind; in young specimens are blotches or zigzag lines of dark fawn-color; teeth well developed; inside with very faint and minute radiating lines; margin white, the remainder bright yellow; there is always a dark purplish blotch along the posterior margin, and it is sometimes mottled with bands and stains of reddish-brown on other parts of the interior; muscular impressions superficial. Length of largest specimens one inch; height, nine tenths of an inch; breadth, seven tenths of an inch.

Fig. 453.



L. Mortoni.

The animal is white, and has short, conical siphons, each marked with a circle of brown spots, and fringed with numerous cirri which extend far beyond the shell (*S. Smith*).

Found plentifully about Nantucket, Martha's Vineyard, and Rhode Island, south of which I cannot learn that it has been found. Extremely abundant at the mouths of creeks and on shallow flats, from low-water mark to two fathoms, Peconic and Gardiner's Bay, Long Island (*Smith*); Dartmouth Lakes, Halifax (*Willis*).

This shell is very closely allied to the *C. lævigatum* of the West Indies, and has no other well-marked distinction than the purple blotch on the posterior margin within, which, so far as I have observed, is never wanting in our species, and never present in the West India shell. In the angular markings of the young shells they are similar, and also in their form and color; but the exterior

of our shell is less smooth and polished than *C. lævigatum*, a difference which might depend on climate. Mr. Sanderson Smith states that he sometimes finds shells in the Long Island bays without the purple blotch.

Genus APHRODITE, Lea. 1834.

Shell sub-cordiform, compressed, rather thin, beaks nearly central, rather prominent; valves smooth or slightly radiated, scarcely gaping; obsolete cardinal teeth.

Aphrodite Grœnlandica.

Shell large, sub-triangular, drab-colored, with very numerous, obsolete radiating ridges; slightly gaping posteriorly, beaks slightly prominent, incurved; margin within salmon-colored, centre opaline.

Cardium Grœnlandicum, Chemn. Conch. vi. t. 19, fig. 198. — Gmélin, Syst. 3232, No. 22. — Brug. Encyc. Méth. 222, No. 17, pl. 300, fig. 7. — Maton and Rackett, Lin. Trans. viii. 69. — Dillwyn, Catal. i. 129. — Lam. An. sans Vert. vi. 407. — Wood, Gen. Conch. 227; Index, pl. 5, fig. 28. — Gould, Inv. 1st ed. 92. — Hanley, Recent Shells, i. 134. — Mighels, Shells of Maine, 15, and in Bost. Journ. iv. 321. — De Kay, Nat. Hist. New York, 206, pl. 23, fig. 250. — Reeve, Conch. Icon. pl. 10, fig. 53. — Forbes and Hanl. Br. Moll. ii. 39. — Middend. Beitr. z. Malac. Ross. iii. 41, pl. 16, figs. 6–9. — Beck, in Gaimard Voy. en Island, Moll. pl. 15.

Mactra radiata, Donovan, Brit. Shells, v. pl. 161.

Cardium edentulum, Montagu, Test. Br. Sup. 29. — Sowerby, Genera, fig. 2; Conchol. Manual, fig. 123*. — Fleming, Brit. Anim. 425.

Aphrodite columba, Lea, Trans. Am. Philos. Soc. (new series), v. pl. 18, fig. 54 (1834).

Aphrodite Grœnlandica, Stimpson, Shells of New England, 19 (1851).

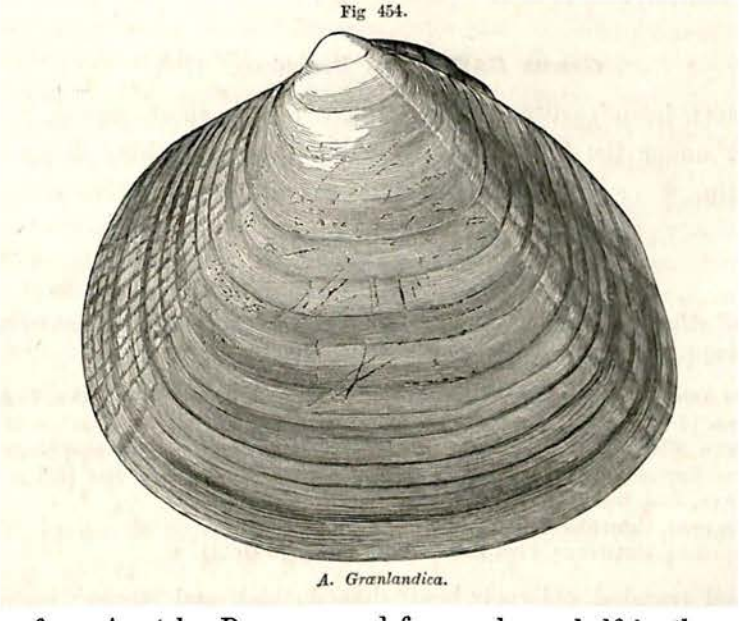
Serripes Grœnlandicum, Chenu, Man. de Conch. ii. 109, figs. 496–498 (1862).

Serripes Grœnlandicus, Packard, Labrad. Mar. Anim. 23.

Shell large, not very thick, sub-triangular, elevated, rather compressed; beaks not very prominent, curved inwards and slightly forwards, nearly central; anterior margin regularly rounded; posterior part somewhat elongated, margin protuberant beyond the ligament, bordered by a slight wave, which gives the posterior termination a somewhat sinuous or truncated appearance, and leaves the shell gaping at this point; this region is also more coarsely wrinkled than the rest; surface marked with minute lines of growth, divided into zones by darker indications of the stages of growth, which successive increments appear very loosely attached posteriorly; these are crossed by numerous inconspicuous, radiating ridges; epidermis thin, shining, of a drab or very light fawn-color; hinge slender; cardinal teeth nearly wanting; marginal teeth distinct,

but small; muscular and pallial impressions profound, within which the shell is opalescent-white, the margin light salmon-color; edge slightly crenated. Length, two and three fourths inches; height, two and three twentieth inches; breadth, one and one quarter inch.

Fig 454.



A. Grænlandica.

One from Awatska Bay measured four and one half by three and three fourths inches; another four by three and three fourths inches.

Brought from the Grand Banks, but not as yet found on the shores of this State. Greenland (*Möller* and *Hayes Coll.*); Beechey Island (*Belcher*); Cape Cod Bay (*Stimpson*); Mingan Island (*Packard*); St. Margaret's Bay, and Bedford Basin (*Willis*); Bic, St. Anne's (*Bell*); large, heavy specimens from Behring's Straits, Awatska Bay (*Stimpson*).

This singular shell, from its triangular, compressed form, and its smooth surface, has rather the aspect of a *Mactra* than a *Cardium*. The not unfrequent entire want of cardinal teeth has misled one distinguished conchologist as to its true relations, while its external characters have so little point that another was not led to it by any existing description, and made of it a new species. Dr. Lovèn informs me that Beck has instituted a new genus for it, which he calls *Serripes*, on account of the serrated margin of the foot.

The old shells, one of which measures in height three and one fourth inches, in length three and three fourths inches, in breadth

one and three fourths of an inch, become solid and strong, and also more tumid, especially behind. The young shells often have the surface variegated with stripes, or angular markings, of a rusty-brown color. This species is also remarkable for gaping posteriorly to a considerable extent.

Genus CARDITA, Bruguières. 1789.

Shell inequipartite, regular; hinge with a short, strong, erect tooth under the beaks, and an oblique one stretching along the margin.

Cardita borealis.

Fig. 59.

Shell obliquely sub-cordate, beaks prominent and recurved, with about twenty radiating ribs; margin crenate; lunule small and deep.

Cardita borealis, Conrad, Amer. Mar. Conch. 39, pl. 8, fig. 1 (1831). — Reeve, Conch. Icon. pl. 7, fig. 33. — De Kay, Nat. Hist. New York, 204, pl. 22, fig. 247. — Middend. Siber. Reise, Moll. ii. 87; Beitr. z. Mal. Ross. iii. 29. — Stimpson, Shells of New England, 18. — Mighels, Shells of Maine, 16; Bost. Journ. Nat. Hist. iv. — Gray, Zool. Beechey's Voy. 152, pl. 44, fig. 1.
Arcturus rudis, Humphrey, MSS.
Cardita vestita, Deshayes, Proc. Zool. Soc. pl. 17, fig. 10 (1852).

Shell rounded, obliquely heart-shaped, thick and strong; inequipartite; the beaks elevated and turned forwards, so as almost to be even with the anterior extremity, which is regularly rounded; posterior margin regularly rounded by a much larger curve, which, meeting the base, forms an obtuse angle; surface raised into about twenty rounded, radiating ribs, which are broader than the grooves between them; these are rendered rough by coarse lines of growth, and covered by a strong, rusty-brown epidermis; lunule very strong, and deeply imprinted, rhomboidal; ligament small and sunken, nearly concealed; hinge strong, two teeth in each valve; in the left valve a small triangular one under the beak, and an oblique, grooved, or partially double one along the posterior margin as long as the ligament; on the right valve a long, tapering, oblique tooth, fitting beneath the two teeth of the opposite valve, and a more slender one on which the ligament partially rests; interior white, margin strongly crenate; impressions

Fig. 455.

C. borealis.

distinct. Length, one inch; height, one inch; width, seven tenths of an inch.

Found along the whole coast of Massachusetts, and is one of the most common shells found in fishes. It is a more northern shell, and is found along the coast of Maine, and in the Arctic seas, of a very large size. Grand Manan, large and common (*Stimpson*); St. George's Banks, thirty fathoms (*Tufts*); at Eastport, plentiful (*Cooper*); Labrador (*Packard*); Fishing Banks, and Halifax, common (*Willis*); Gulf St. Lawrence (*Bell*); Sandy Hook, one specimen (*Cooper*); Gardiner's Bay, Long Island (*Smith*).

The shape of the shell is much varied by age. In the young the beaks are nearly central, very little elevated, and scarcely recurved; but the posterior portion, advancing in growth faster than the anterior, produces the obliquity of the old shell. [*C. vestita* is an elongated, middle-aged variety.] It is closely allied to *C. tridentata*, Say, but it grows to a much larger size, is more inequipartite, and has two teeth in the right valve, while that shell has but one.

Family ARCADÆ.

Teeth small, numerous, disposed in a line along the hinge-margin of each valve.

Genus ARCA, Lin. 1758.

Shell elongated, beaks separated by a diamond-shaped area for the ligament; series of teeth in a straight line.

Arca pexata.

Fig. 60.

Shell oblong; beaks prominent, very oblique; the ligamentary space very narrow; surface with about thirty-two radiating ribs, covered with a shaggy brown epidermis.

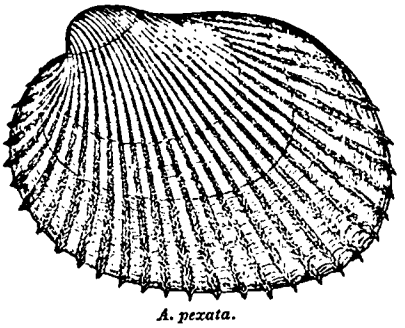
Arca pexata, Say, Journ. Acad. Nat. Sc. ii. 268 (1822). — De Kay, Nat. Hist. New York, 176, pl. 12, fig. 211. — Philippi, Abbild. pl. 1, fig. 4. — Stimpson, Shells of New England, 8. — S. Smith, Shells of Long Island, 15, and in Ann. N. Y. Lyc. vii.

Argina pexata, Adams, Gen. ii. 540, pl. 125, figs. 7, 7 *a*. — Chenu, Man. de Conch. ii. 175, fig. 873.

Shell thick and heavy, oblong, somewhat ovate; very inequipartite; the beaks are ventricose and prominent, directed very obliquely forwards, terminating in points which are nearly in contact over the

anterior termination of the series of cardinal teeth; at the other extremity of the series, the outline of the shell, which is elsewhere regularly rounded, has an obtuse angle; the ligamentary area, or space between the beaks, is very narrow, scarcely separating them. Surface with thirty-two to thirty-six radiating ribs, rather broader than the channels between them; these are traversed by minute lines of growth, and interrupted by the more distinct overlapping zones of increase. The whole is covered by a thick, shaggy, fibrous epidermis of a dark-brown color, sometimes protruding from the interstices of the ribs in a fringe-like manner. Interior white, the margin polished, and profoundly scalloped by the alternate terminations of the ribs and grooves. In continuation of the regular series of teeth are a few irregular pits and prominences which fit into each other. Length, two and one fourth inches; height, two and one tenth inches; breadth, one and one half inches.

Fig. 456.



A. pexata.

The *Arca pexata* has never been found to the north of Cape Cod. I have it from Martha's Vineyard; it is not rare in Buzzard's Bay, and is common about Rhode Island. Osterville (*Haskell*).

It is distinguished from other North American species by the position of its beaks, its epidermis, its narrow area between the beaks, and by its being equivalve. Its height increases posteriorly, so that the interior of a valve has an ovate shape.

Mr. Say remarks, that, when violently opened, an effusion of red sanies issues; and hence it has acquired the name of *bloody clam.*

Arca transversa.

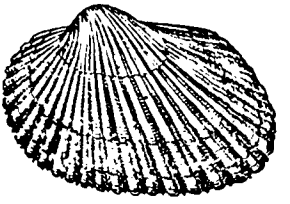
Shell rhomboidal, with from thirty-two to thirty-five ribs; beaks at the anterior third of the series of teeth.

Arca transversa, Say, Journ. Acad. Nat. Sc. ii. 269 (1822). — Stimpson, Shells of New England, 8. — S. Smith, Shells of Long Island, 15, and Ann. N. Y. Lyc. vii. — De Kay, Nat. Hist. New York, 177, pl. 12, fig. 212.

"Shell transversely oblong, rhomboidal, with from thirty-two to thirty-five ribs placed at nearly the length of their own diameters

distant from each other. Apices separated by a long narrow space, and situated at the termination of the posterior (anterior) third of the length of the hinge-margin; extremities of the hinge-margin angulated; anterior (posterior) edge, the superior half rectilinear; posterior (anterior) edge rounded; inferior edge nearly rectilinear, or very obtusely rounded; on the hinge space, one or two angulated lines are drawn from the apex diverging to the hinge edge." (*Say.*) Length, one and a half inches; height, one inch; breadth, one and a half inches.

Fig. 456 *a*.



A. transversa.

Found about the sands of Nantucket and Martha's Vineyard, and it is said to be not uncommon in Buzzard's Bay. Osterville (*Haskell*); Gull Island (*S. Smith*); from Artesian well, Provincetown, one hundred and twenty to two hundred feet below surface.

I have quoted the description by Mr. Say, above, merely interchanging the terms anterior and posterior, to accord with the parts of the shell to which those terms are applied in other parts of the Report. The position of the beaks distinguishes it from the preceding species, as well as the form of the shell.

Genus NUCULA, Lamarck. 1799.

Shell transverse, without an area for the ligament between the beaks; a straight series of teeth each side, forming an angle at a spoon-shaped pit which separates them.

Nucula tenuis.

Fig. 64.

Shell trapezoidal, thin, smooth, without radiating lines; epidermis grass-green; beaks prominent, placed posteriorly; margin simple, teeth very few.

Arca tenuis, Montagu, Test. Brit. Suppl. 56. pl. 29, fig. 1. — Dillwyn, Catal. i. 246. — Turton, Conch. Dict. 11. — Wood, Ind. Test. pl. 10, fig. 45.

Nucula tenuis, Turton, Brit. Biv. 177. — Fleming, Brit. Anim. 402. — Brown, Ill. Conch. G. Br. 85, pl. 33, fig. 13. — Hanley, Recent Shells, i. 171, pl. 10 (*Arca*), fig. 45. — McGilliv. Moll. Aberd. 244; Br. Mar. Conch. 105. — Forbes and Hanl. Br. Moll. ii. 223, pl. 47, fig. 6, and pl. P. fig. 5 (animal). — Lovèn, Ind. Moll. Scand. 34 — Michels, Shells of Maine; Bost. Journ. iv. 323. — Stimpson, Shells of New England, 8. — Packard, Labrad. Mar. An. 13. — Sowerby, Conch. Ill. No. 33, figs. 140, 141.

This shell is very similar to the following, and would not at once be distinguished from it. The following are some of the essential differences. The anterior margin, instead of running straight to the anterior tip, runs about half the distance parallel with the base, then forms an angle, and, by a broadly rounded curve, joins the curve of the base; the tip is, therefore, not pointed as in *N. proxima*, and the angle of this end gives the shell a four-sided, instead of a triangular figure, the greatest height being somewhat before the beaks; beaks prominent, curved backwards, and having a deep pit behind them, not found in the other species; posterior margin forming as much as a right angle with the anterior; while in *N. proxima* we have rather less than a right angle. The surface is smooth, glossy, grass-green, without any radiating lines. Interior a silvery-white, but not pearly like the other. The teeth are very long and slender, scarcely if at all folded, and only about eight before and four or five behind the beaks. The interior margin is always simple, but never so in the smallest specimens of *N. proxima*. The shell is very thin, and its breadth very small. Length, three tenths of an inch; height, one quarter of an inch; breadth, three twentieths of an inch.

Fig. 457.

N. tenuis.

Found in the stomachs of fishes, but much more sparingly than the following. Casco Bay (*Mighels*); Eastport, rare in fifteen to twenty fathoms (*Cooper*); Halifax, Sambro Banks (*Willis*); St. Anne, Capuchin, &c. (*Bell*); Northumberland Sound and Port Refuge (*Belcher*); Labrador (*Packard*); Northern coasts of England; Drontheim to North Cape (*McAndrew*).

This shell, as far as I can recollect, is the one in the collection of the Academy of Natural Sciences at Philadelphia, marked "*N. lucida*, Blanding." It corresponds precisely with a specimen of *Nucula tenuis* sent me by Mr. Sowerby, and it is his opinion that they are identical.

Nucula proxima.

FIG. 63.

Shell oblique, ovate-triangular, anterior end perpendicular to the base; crossed by minute, concentric, and radiating lines; epidermis olivaceous; within pearly, margin crenulated; teeth, twelve before and eighteen behind the beaks.

Arca nucleus, LIN. Syst. Nat. 1143 (in part, probably). — DONOV. Br. Sh. ii. 63; Chenu ed.
Nucula margaritacea, LAM., BROWN, Ill. Conch. G. Br. 85, pl. 33, fig. 12.
Nucula nucleus, FORBES and HANL. Br. Moll. ii. 215, pl. 47, figs. 7, 8. — HANLEY, in Thes. Conch. iii. 148, pl. 229, figs. 121, 122. — LOVÈN, Ind. Moll. Scand. 34.

Nucula proxima, Say, Journ. Acad. Nat. Sc. ii. 270 (1822). — Conrad, Amer. Mar. Conch. pl. 6, fig. 2. — Gould, Inv. Mass. 1st ed. 103, fig. 63. — Hanley, Biv. Sh. 172, pl. 20, fig. 5; in Thes. Conch. iii. 151, pl. 229, figs. 131, 132. — De Kay, Nat. Hist. New York, 179, pl. 12, fig. 215. — Stimpson, Shells of New England, 8; Inv. Gr. Manan, 20. — S. Smith, Moll. of Long Island, 15. — Mighels, Shells of Maine, 17, and Journ. Bost. Soc. iv. 323.

Shell small, thick, and solid, very oblique, triangular, the outline and angles a little rounded; the anterior end nearly vertical, and about two thirds the length of the posterior margin, forming something less than a right angle with it; beaks somewhat elevated, inclined forwards; anterior slope with a large, ovate area, defined by an angular ridge; posterior edge broad and flattened; surface crossed with somewhat coarse lines of growth, and by very minute radiating lines; epidermis light olive color, with darker zones; interior pearly, the margin very finely crenulated; cartilage pit very small; series of teeth twelve before and eighteen behind the beaks, including the very small ones near the pit, short and broad, the two series nearly at right angles with each other. Length, nine twentieths of an inch; height, near anterior margin seven twentieths of an inch; breadth, five twentieths of an inch.

Fig. 458.

N. proxima.

Found not uncommonly in the stomachs of fishes taken near Nahant. Professor Adams found it abundantly at Dartmouth, in mud taken up beyond low-water mark; and Dr. Yale sent it to me collected on the shores of Holmes's Hole. Marblehead Harbor, seven fathoms (*Haskell*); Charles River below the bridges, Salem Harbor, Grand Manan (*Stimpson*); Casco Bay (*Mighels*); Fishing Banks (*Willis*); Long Island Sound (*Smith*); whole coast, from South Carolina (*Stimpson*).

By many, this shell has been supposed identical with the N. *nucleus* of English authors, — the *N. margaritacea* of Lamarck. But actual comparison shows a wide difference. The *N. nucleus* is less triangular, the posterior tip broadly rounded; its proportional diameter is not more than half as great, the epidermis is firm and darker, the teeth are ten and twenty, and the whole shell is double the size of ours. It is much more closely allied to, if not identical with, a shell sent me by Mr. Sowerby under the name of *N. nitida*. The number and arrangement of teeth is the same; and if there be any difference, it is that the British shell is smoother, narrower, the angle made by the anterior and superior margins is greater, and the shape less obliquely transverse. The striæ are very obvious under the epidermis. In young specimens a series

of transverse indentations may be seen along each side of the posterior hinge-margin.

[The above comparisons were made with specimens sent from England, none of which are now regarded as the true *N. nucleus;* and since two or three species have been eliminated (*N. radiata, decussata, nitida*, &c.) the remainder seem in no respect to differ from the American shell.

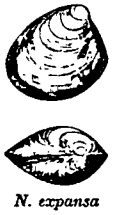
Nucula expansa.

Shell large, ovate-triangular, tumid, dusky, chestnut-colored surface, distinctly waved, and with fine radiating striæ on both dorsal areas.

Nucula Bellotii, ADAMS, Zool. Proc. (1856), p. 51. — HANLEY, in SOWB. Thes. Conch. iii. 162, pl. 229, fig. 128. — PACKARD, Labr. Mar. Sh. 13.
Nucula expansa, REEVE, in Belcher's last Arct. Voy. 397, pl. 33, fig. 2 (1855).

Shell large, thin, ovate triangular, tumid, without marked umbonal ridges; anterior dorsal margin nearly vertical and straight, the area broad heart-shaped, depressed, bounded by an obtuse ridge and marked by fine diverging striæ, anterior end rounding into the decidedly arcuate ventral margin; posterior dorsal margin much longer and more oblique than the anterior, gently curved, and with no angles; dorsal face broad, somewhat flattened, with the lips of the valves scarcely pouting, and with a few delicate radiating lines; surface concentrically ridged, quite coarsely so at the outer circles; epidermis glossy, dark chestnut, with yellowish zones. Interior leaden color, muscular impressions deep, margin simple, covered by the inflected epidermis; hinge rather robust, the ligament spoon very oblique, with about ten teeth in front and fifteen behind it. Length, eleven twentieths of an inch; height, seven twentieths of an inch; breadth, six twentieths of an inch.

Fig. 459.



N. expansa

Dredged by Dr. Packard in fifteen fathoms at Chataque Bay, Labrador; Arctic Seas (*Hanley*); Beechey Island (*Belcher*).

One of the largest and finest of the genus, so remarkable for its undulated surface and dark epidermis as to assimilate it to *Corbicula*.

Nucula inflata.

Shell trapeziform, obliquely truncated, tumid, beaks prominent, anterior.

Nucula inflata, HANCOCK, Ann. Nat. Hist. (1846), 333, pl. 5, figs. 13, 14. — HANLEY, in SOWB. Thes. Conch. iii. 162 (*Nucula*), pl. 4, figs. 115, 116.
Nucula tenuis, MÖLLER, Moll. Grœnl. 17.
Nucula obliquata, BECK (1847), teste MÖRCH.

Shell trapeziform, inflated, beaks at anterior fourth, prominent, rather obtuse, angle of dorsal margins at the beaks a right angle, anterior slope nearly vertical, with a broad heart-shaped lunule defined by a rather acute ridge, with the included edges of the valves a little pouting, and marked by very faint diverging striæ; posterior dorsal margin for about half its length nearly horizontal and then obliquely truncate, so as to make the hinder end biangular, and so that the acutely rounded tip is near the ventral margin; the posterior dorsal face is broad, lozenge shaped, defined by a pretty distinct umbonal ridge, the valve edges compressed and the color paler; epidermis yellowish green, shining, rather coarsely striate concentrically. Interior silvery, margin simple, hinge with about five teeth before and ten behind the large oblique ligament cavity. Length, three tenths of an inch; height, five twentieths of an inch; breadth, three twentieths of an inch.

Fig. 460.

N. inflata.

Dredged by Dr. Packard at Henley Harbor, Labrador; Greenland (*Möller*); Arctic Seas (*Hancock*).

Generally resembling *N. tenuis*, but more inflated, and angular in all its outlines.

Nucula delphinodonta.

Shell minute, triangular, oblique, very broad, beaks nearly terminal, three anterior and seven posterior teeth.

Nucula delphinodonta, Mighels, Bost. Journ. Nat. Hist. iv. 40, 324, pl. 4, fig. 5 (1842). — Stimpson, Shells of New England, 9; Proc. Bost. Soc. iv. 13; Inv. Gr. Manan, 20. — Mörch, Prod. Moll. Grœnl. 21.

Nucula corticata, Holboll and Möller, fide Mörch.

Shell quite small, obliquely triangular, very broad, and tumid, beaks nearly at the posterior point; posterior margin nearly vertical, passing by a rounded right angle into the slightly curved ventral margin; anterior dorsal margin descending at an angle of 45° and terminating in an acutely rounded point; dorsal face broad, beaks elevated and tumid, with a deep heart-shaped excavation under the beaks bordered by a delicate but acute ridge running to the basal angle; a smooth, flattened, lanceolate area in front of the beaks; surface with coarse unequal striæ of growth; epidermis olivaceous. Hinge with three posterior and seven anterior sharp, elongated teeth. Length, thirteen hundredths of an inch; height, eleven hundredths of an inch; breadth, nine hundredths of an inch.

Fig. 461.

N. delphinodonta. 2/1

Found in the stomachs of codfish in Casco Bay, in great numbers (*Mighels*); whole coast, laminarian region (*Stimpson*). Abundant on sandy and muddy bottoms. Cape Ann, thirty fathoms; Race Point, twenty-two fathoms; Broad Sound, six fathoms; Grand Manan (*Stimpson*); Greenland (*Mörch*).

The animal has the mantle freely open, forming no siphons; the foot large, hyaline, with a deep fissure and serrated edges, protruded from the longer side. It is very active (*Stimpson*).

Distinguishable from other species by its small size and tumid, almost globose form, as well as by the number of teeth.

Genus YOLDIA, Möller. 1832.

Shell oblong-ovate, compressed, rostrate posteriorly; with fine concentric or oblique striæ, covered with a varnished epidermis; slightly pearly within. Pallial impression with a small sinus. Animal with a large foot, mantle open and ciliate, siphons adnate, long, and very slender.

Yoldia limatula.

Fig. 62.

Shell oblong-ovate, rostrated, very smooth and shining; beaks sub-central; teeth twenty-two on the anterior, and eighteen on the rostrated side.

Nucula limatula, Say, Amer. Conch. pl. 12 (1831). — Gould, Inv. Mass. 1st ed. 98, fig. 62. — De Kay, Nat. Hist. New York, 180, pl. 12, fig. 218. — Conrad, Amer. Mar. Conch. 30, pl. 6, fig. 1. — Hanley, Biv. 170, pl. 20, fig. 4. — Sowerby, Thesaur. Conch. (*Nucula*), pl. 1, fig. 9. — Mighels, Cat. Shells of Maine, 16, and in Bost. Journ. Nat. Hist. iv. 322.

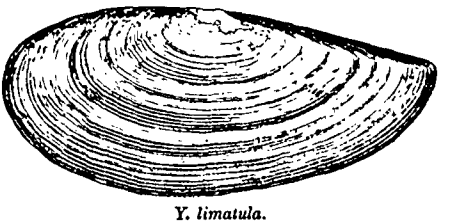
Yoldia limatula, Adams, Gen. ii. 548, pl. 126, figs. 5, 5 *b*. — Chenu, Man. de Conch. ii. 180, fig. 905.

Leda limatula, Stimpson, Shells of New England, 10 (1851). — S. Smith, Moll. of Long Island, 15, and in Ann. N. Y. Lyc. vii.

Shell transversely ovate, very much elongated, thin, lines of growth very minute, otherwise smooth and covered with a beautifully glazed, light green epidermis, with an occasional darker zone, and two or three lighter radiations; beaks nearly central, not prominent, inclined backwards; hinge-margin behind rectilinear nearly to the tip, compressed, the compression not reaching the tip, which is a little recurved, pointed, and not truncated; anterior and basal margin almost regularly rounded, entire; interior bluish-white,

somewhat pearly; cartilage-pit small; the series of teeth, extending more than two thirds the length of the shell, is slightly bent at the pit; teeth prominent, most so at the middle of each side, their summits forming a regular arch, twenty-two on the anterior, and eighteen on the rostrated side, excavated on their outer faces; impressions quite obvious. Length, one and nine tenths inches; height, nine tenths of an inch; breadth, five tenths of an inch.

Fig. 462.



Y. limatula.

Found in various parts of Massachusetts Bay; Boston Harbor, in two to ten fathoms mud; Eastport, in six fathoms (*Stimpson*); Vineyard Sound (*Agassiz*); Long Island Sound (*Prime*); Portland Harbor (*Mighels*); Fishing Banks (*Willis*); Capuchin, Marcouin, St. Anne (*Bell*); Nordland (*McAndrew*).

Animal with siphons united, the anal one translucent, the branchial opaque white, both fringed at openings; edges of foot-lobes simple.

This beautiful shell may be distinguished from other species of our coast by its length, which is more than twice as great as its height. Its posterior portion is also more narrowed than in other species. The dimensions given above are those of a specimen larger than is ordinarily found. But I have a single valve sent me by Dr. Mighels of Portland, which he dredged in the harbor of that place, where he found them abundantly, measuring two and three tenths inches in length, and one and one tenth inches in height. He informs me that the animal is very active, and that it leaps to an astonishing height, exceeding in this faculty the *scallop-shells*. (See Catal. of the Shells of Maine, 16).

Yoldia obesa.

Shell very small, oval, smooth, beaks nearly central; teeth small, ten in front and twelve behind.

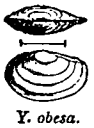
Leda obesa, Stimpson, Proc. Bost. Soc. Nat. Hist. iv. 13 (1851); Shells of New England, 10, pl. 2, fig. 1; Check Lists.

Nucula navicularis, Mighels (not Couthouy), Shells of Maine, 17, according to Adams.

Shell quite small, thin and fragile, of an elongated oval form, the posterior part, which is a little the longer, being obtusely rounded

at the point, even more so than the anterior end; the valves are tumid, and only a very narrow portion of the posterior dorsal edge is compressed; apices obtuse; ventral margin gently and uniformly arched; surface very delicately striated concentrically, and covered with a pale yellowish-green epidermis; hinge very delicate, with ten teeth in front and twelve behind the apex. Length, three twelfths of an inch; height, one eighth of an inch; breadth, one tenth of an inch.

Fig. 463.



Y. obesa. 2/1

Taken in deep water in Massachusetts Bay.

It is narrower and more inflated than the young of *Y. thraciæformis*, and is quite remarkable for its regularly oval, non-rostrate form. It is very similar in size and general appearance to *Yoldia pygmæa*, Münst, but that shell is pretty distinctly pointed and slightly upturned at the end.

Yoldia siliqua.

Shell oblong-ovate, emarginate under the posterior tip; beaks nearly median, prominent; posterior dorsal margin straight, compressed.

Nucula glacialis, Gray, in Index Test. Supp. pl. 2, fig. 6. — Hisinger, Icon. Petr. Succ. pl. 30, fig. 13 (fossil); Lethæa Succ. 60.

Nucula truncata, Brown, Conch. Gr. Brit. 84, pl. 33, fig. 18.

Nucula Portlandica, Hitchcock, Bost. Journ. i. 327 (woodcut 328). — Reeve, in Belcher's last Arct. Voy. 396, pl. 33, fig. 3.

Nucula siliqua, Reeve, in Belcher's last Arct. Voy. pl. 33, fig. 4 (1855); Proc. Zool. Soc. 48 (1856).

Nuculana glacialis, Mörch, Prodr. Moll. Grœnl. 21 (1857).

Leda (*subg. Portlandia*) *glacialis*, Hanley, in Thes. Conch. iv. 144, pl. 227, figs. 31, 32 (1860).

Yoldia glacialis, Gray, Catal. Br. Moll. 161 (1851).

Shell oblong-oval, ventricose, beaks large and unusually prominent, a little in advance of the middle; anterior end rounded, rather acutely; ventral margin very gently curved, a little pouched opposite to the beaks and also at the termination of the umbonal ridge, between which and the posterior point the ascending margin is a little concave; the posterior dorsal edge is sharp and straight, and meeting the ascending margin forms an acute-angled point; this caudal portion is very much compressed; the dorsal area is flattened and defined by an obtuse ridge; surface somewhat coarsely waved, and marked also by delicate incremental undulating ridges of

Fig. 464.

Y. siliqua.

growth, over which the epidermis rises like a very delicate fringe. Hinge with the ligament spoon broad, deep, very slightly oblique, and with twelve to fourteen stout teeth on each side of it. Siphonal sinus quite obvious. Length, eight tenths of an inch; height, five tenths of an inch; breadth, three tenths of an inch.

Found in a semi-fossil condition in the clays about Portland and Montreal. It is found in a recent condition in the Arctic seas; Beechey Island (*Belcher*); Greenland (*Mörch*). Mr. Hanley has indicated a subgenus *Portlandia*, to receive this and a few other species which are conspicuously emarginated below the tips, and closed at both ends.

Yoldia thraciæformis.

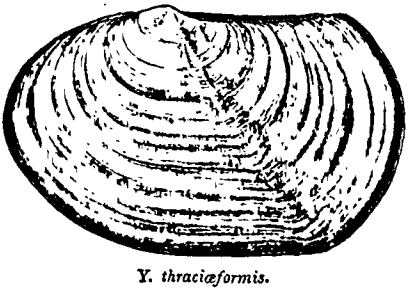
Fig. 66.

Shell kidney-shaped, inequipartite, covered with a dark olive-green epidermis; a rib-like wave passes from the beaks to the posterior-inferior angle; gaping at both ends.

Nucula thraciæformis, Storer, Bost. Journ. Nat. Hist. ii. 122 (woodcut). — Gould, Inv. Mass. 97, fig. 66. — De Kay, Nat. Hist. New York, 178, pl. 12, fig. 217. — Hanley, Recent Shells, Biv. 169, pl. 20, fig. 15. — Sowerby, Thes. Conch. pl. 1, figs. 4, 13.
Leda thraciæformis, Stimpson, Shells of New England, 9 (1851); Inv. Gr. Manan, 20.
Nucula navicularis, Couthouy, Journ. Bost. Soc. ii. 178, pl. 4, fig. 4 (young). — Gould, Inv. Mass. 103.
Yoldia thraciæformis, Mörch, Moll. Grœnl. 21 (1857). — Möller, Prod. Moll. Grœnl. 21.
Yoldia angularis, Möller, Moll. Grœnl. 17, and in Mus. Amsterdam.
Nucula laternaria, Valenc. Voy. of Venus, Moll. pl. 23, fig. 5.
Yoldia Mülleri, Gray, Voy. of Fly, Append. ii. 361, pl. 2, fig. 4.

Shell oblong-ovate, or rather kidney-shaped, somewhat pointed before, broadest and truncated behind, thin; gaping at both ends; inequilateral; the beaks considerably elevated, pointed, inclined backwards, and touching each other, are situated near the anterior third of the shell; an obtuse, rib-like wave passes obliquely over the shell from the beaks to the posterior third of the basal margin, dividing the surface of the shell into two unequal triangles; the outline of the anterior triangle is regularly curved, excepting a shallow, lengthened notch between the centre of the base and the wave; the

Fig. 465.



Y. *thraciæformis*.

upper margin of the other triangle is nearly direct, a little upturned or beaked, and its edge is compressed into a sharp crest, the posterior margin moderately rounded, joining above and below with an abrupt curve of a truncated appearance; the anterior portion is inflated, and the epidermis of a dusky green; the posterior portion is compressed, has one or two faint waves or radiations, and the epidermis is of a lighter yellowish-green, minutely wrinkled; surface coarsely marked with lines of growth, and covered with a sooty powder, which easily rubs off and leaves a glossy black. Hinge with a very large, spoon-shaped cavity, and on each side of it are about twelve teeth, each one folded from the centre to an angle of 45°; cavity of the beaks very capacious; interior polished white, impressions faint, the pallial one with a deep sinus. Length, two and four fifths inches; height, one and thirteen twentieths inches; breadth, one and one tenth inches.

Animal with the mantle thin edged, a large foot divided by a deep groove, the edges when expanded simple; the labial organs very large and protruding from the ventral margin.

First taken by Dr. Storer from the stomachs of *Pleuronectes dentata*, or *sand-dab*, caught off Race Point, in December, 1837. In that winter a dozen or more specimens were taken from the same species of fish, and from the same locality; but last winter they were sought for without success. Fishery Banks (*Willis*); Duck Island, Grand Manan (*Stimpson*); Greenland (*Möller*).

It is a very extraordinary shell, far exceeding in size any known species of the genus. Indeed, its peculiar shape, very large spoon-hinge, and the teeth folded like those of *Arca*, entitle it to a generic distinction so far as the shell is concerned; and I believe that a knowledge of the animal will establish its claims to one.

The young form was thus described as *Nucula navicularis* in the first edition: —

Shell small, thin, fragile, of a crescentic or somewhat kidney-shaped form, smooth, tumid at the beaks, and compressed at the sides, slightly gaping at both ends; beaks very nearly central, prominent, and directed backwards; anterior side elliptically rounded; posterior side somewhat narrowed and compressed, and very slightly truncated; basal margin strongly curved; surface smooth, with very indistinct lines of growth; epidermis a light pea-green, thin, with many eroded spots. Ligamentary fosset broad, prominent, and oblique; teeth about eight before and ten behind the fosset. Interior glossy white; margin simple. Length, eleven

twentieths of an inch; height, five twentieths of an inch; breadth, three twentieths of an inch.

Found in the stomachs of fish caught off Nahant and Plymouth; not common.

This small shell might at first be regarded as the young of some other species. But the central position of the beaks, the number of teeth, and its crescentic or boat-shaped form, are good characteristics. The size above indicated is about one third larger than that of the specimens usually found.

Yoldia sapotilla.

FIG. 61.

Shell elongated-ovate, sub-equipartite, sub-rostrated, tumid at the beaks, with a slight flexure under the posterior tip, pale yellowish-green, polished; teeth about sixteen on each side.

Nucula sapotilla, GOULD, Inv. Mass. 100, fig. 61 (1841). — DE KAY, Nat. Hist. New York, 180, pl. 13, fig. 220. — SOWERBY, Thes. Conch. (*Nucula*) fig. 16. — HANLEY, Recent Shells, 170, pl. 20, fig. 3.

Leda sapotilla, STIMPSON, Shells of New England, 10 (1851); Inv. Gr. Manan, 20. — S. SMITH, Moll. of Long Island, 15, and Ann. N. Y. Lyc. vii. — REEVE, in Belcher's last Arct. Voy. ii. 397.

Yoldia sapotilla, PACKARD, Mar. An. of Labrador, 13 (1861). — STIMPSON, Check Lists.

Shell ovate, prolonged, thin, fragile, translucent, the beaks a little in advance of the centre, not elevated, but considerably inflated laterally; anterior half regularly semi-oval; posterior portion narrowed and compressed, the line running from the beaks to the posterior tip straight, and rendered sharp by the compression of a very narrow portion of the margin; beneath the tip is a truncation or shallow indentation of the margin, bounded by a wave-like swell passing from the beaks to its anterior termination; surface marked only by exceedingly minute concentric lines, and covered by a very thin and glossy epidermis of a light yellowish-green color, with an occasional narrow zone of a darker color; within pearly white; cavity of the cartilage deep and triangular; teeth about sixteen or eighteen on each side, long and pointed, very small and crowded at the centre. Length, nine tenths of an inch; height, four fifths of an inch; breadth, three tenths of an inch.

Fig. 466.

Y. sapotilla.

Inhabits the vicinity of Cape Cod, where it may be found in the stomachs of fishes, and also by dredging. Many specimens have

been kindly furnished me by Colonel Totten, which he took by dredging in Provincetown Harbor. Eastport, Grand Manan (*Stimpson*); Fishing Banks (*Willis*); Labrador (*Packard*); Long Island Sound (*S. Smith*); Northumberland Sound (*Belcher*).

This is the living analogue of the fossil species described by Mr. Say under the name of *N. lævis*, in "American Conchology," pl. 12. In size, shape, and the position of the beaks they accurately agree; but the fossil species wants the emargination or flexure under the posterior tip. *Y. myalis* is greater in height, thicker, darker, and has the beaks about as far removed towards the posterior as they are towards the anterior extremity in this shell.

Eroded spots, filled with a black substance, are frequently seen externally, which are marked by a corresponding chalky opacity within.

In its shape, and the perfect polish of its surface, this shell resembles the seed of the Sapotilla (*Achras sapota*), a tropical fruit; and I have substituted that name instead of *N. lævigata*, under which I gave the specific characters of the shell in the "American Journal of Science," as I find that name preoccupied.

[Though the specific value of the shell here described has been thus far unchallenged, upon an examination of many specimens I am not fully satisfied that it is anything more than an abbreviated variety of *Y. limatula*.

Yoldia myalis.

Shell ovate, smooth, olive colored; anterior part longest and rounded; posteriorly acuminated, and sub-rostrated; teeth about twelve on each side.

Nucula myalis, COUTHOUY, Bost. Journ. Nat. Hist. ii. 61, pl. 3, fig. 7 (1838). — GOULD, Inv. Mass. 1st ed. 99. — DE KAY, Nat. Hist. New York, 180, pl. 12, fig. 219. — SOWERBY, Thes. Conch. (*Nucula*) pl. 1, fig. 18. — MIGHELS, Shells of Maine, 17, and Journ. Bost. Soc. iv.

Leda myalis, STIMPSON, Shells of New England, 10 (1851); Inv. Gr. Manan, 20.

Nucula hyperborea, LOVÉN.

Fig. 467.

Y. myalis.

Shell ovate, thin, slightly gaping at both extremities, moderately convex; surface somewhat undulated by distant concentric ridges, and covered with an olive-colored epidermis, arranged in alternate darker and lighter zones; beaks not elevated, a little behind the middle; anterior part semi-elliptical; posterior part sub-triangular, upper margin behind the beaks straight, compressed and sharp to the very tip, which

is obtusely pointed as the regular curve of the base meets the dorsal line, though in many instances there is a slight flexure just below the point. Interior yellowish-white, glossy, with greenish zones, and minute radiating lines or striæ; cartilage cavity deep, triangular; series of teeth about twelve on each side, but sometimes increased to sixteen or eighteen, increasing in size and distance towards the outer extremities. Length, one and one tenth of an inch; height, seven tenths of an inch; breadth, seven twentieths of an inch.

Taken from the stomachs of fish caught in various parts of Massachusetts Bay. Eastport to Cape Cod, Grand Manan (*Stimpson*); Gulf St. Lawrence (*Mighels*); Halifax (*Willis*).

The general aspect of this species is like that of *Y. limatula*. It is distinguished by the position of the beaks, and the smaller number of teeth; the whole shell, and the posterior portion especially, is less elongated, and the epidermis is of a darker, more strictly olive color, and far less glossy. It never attains to so great a size. It has almost precisely the shape and size, but none of the oblique striæ of *N. arctica*, Broderip and Sowerby. A shell from Spitzbergen sent me by Dr. Lovèn, and named by him *N. hyperborea*, as to the exterior and the position of the beaks is like this; but its height is less, and there are eighteen teeth in the posterior range. [Doubtless identical.

Genus LEDA, Schumacher. 1817.

Shell produced behind and rostrate, line of teeth interrupted by the oblique, depressed deltoid pit for the ligament, most numerous behind the pit; pallial sinus very small. Mantle open, simple; foot large, club-shaped, divided below and dilatable into a disk; siphons formed by a coherence of the mantle at three points.

Leda tenuisulcata.

Shell ovate-lanceolate, inequipartite, posteriorly much narrowed and rostrated; surface with numerous concentric ridges, covered with a light greenish-yellow epidermis; teeth twelve before and sixteen behind the beaks.

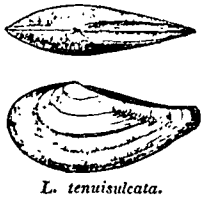
Nucula tenuisulcata, Couthouy, Bost. Journ. Nat. Hist. ii. 64, pl. 3, fig. 8 (1838). — Hanley, Biv. 377, pl. 20, fig. 17. — Philippi, in Menke's Zeitsch. 75 (1845).

Nucula minuta, Gould, Invert. 101. — De Kay, Nat. Hist. New York, 181. — Mighels, Shells of Maine, 17, and Bost. Journ. iv. 323.

Leda tenuisulcata, Hanley, in Thes. Conch. iii. 112, pl. 228, fig. 87 (1860). — Stimpson, Inv. Gr. Manan, 21; Shells of New England, 10 (1851).

Shell ovate-lanceolate, thin, the posterior part double the length of the anterior, narrowed to a point, the tip being a little upturned, truncated and gaping, the upper margin straight and sharp; anterior side ovally rounded; surface wrought into numerous and crowded concentric folds, the interspaces rather broadest, excepting a compressed, lanceolate area behind the beaks reaching nearly to the tips, which is smooth and shining; a delicate, sub-marginal angle runs from the beaks to the lower angle of the truncated tip, at which the concentric folds or ribs are bent at nearly a right angle, so as to be parallel to the margin; epidermis light greenish-yellow, or sap-green color, within pearly white; an elevated ridge runs from within the cavity of the beaks to the lower angle of the truncated tip, corresponding to the exterior angle; teeth twelve to fourteen before the beaks, and sixteen to eighteen behind them. Length, one inch; height, nine twentieths of an inch; breadth, three tenths of an inch.

Fig. 468.



L. tenuisulcata.

Found, not very rarely, in the stomachs of fishes taken off Nahant. Provincetown Harbor (*Totten*); off Isle of Shoals (*Wheatland*); Casco Bay (*Mighels*); Eastport and Grand Manan (*Stimpson*); Halifax (*Willis*).

This shell is readily distinguished from our other species by the folds and grooves of its surface. It is much more pointed than the other species, and does not attain to a large size, the above dimensions being those of a shell one third longer than the usual size. I have carefully compared our shell with a specimen of *N. minuta*, from the coast of Norway, sent me by Dr. Lovén, and can find no difference in the number of teeth, or in any other respect. [This comparison refers to the elongated and compressed form which is still considered the typical form of *N. minuta* in the British Mollusca, but which Mr. Hanley has since separated, rightly, as I think, to represent the *N. caudata* of Donovan as a distinct species. Our shell is somewhat more elongated and less recurved, and grows to a much larger size; still, the distinction is not positively marked. In size and form it is more like *L. pernula*, but the striation is much coarser, and there is lacking the lustre and radiating corrugations of the epidermis found on that shell.

Ledà Jacksonii.

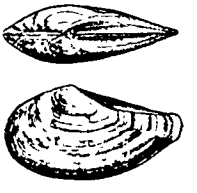
FIG. 65.

Shell ovate, convex, inequipartite, posteriorly diminishing to a narrow, ascending beak, truncated at tip, and with a flexure in the margin beneath it; surface with concentric, elevated lines; teeth fifteen before, and twenty behind the beaks.

Nucula Jacksonii, GOULD, Inv. Mass. 1st ed. 102, fig. 65 (1841).
Leda buccata, STEENSTRUP, in Möller's Moll. Grœnl. 17. — SOWERBY, Thes. Conch. No. 15, figs. 63, 64. — PACKARD, Labrad. Mar. Anim. 13.
Nuculana buccata, MÖRCH, Prodr. Moll. Grœnl. 21 (1857).

Shell ovate, elongated, ventricose, rather solid; beaks at the anterior third; anteriorly rounded; posteriorly rapidly attenuated so as to form a somewhat ascending beak, truncated at tip; posterior hinge-margin straight and sharp, compressed at each side so as to form a broad area defined by denticulated lines, and smooth; under the tip is a flexure or shallow indentation of the basal margin, and an elevated ridge runs from the beaks to the lower angle of the tip; surface covered with fine, crowded, elevated, concentric lines; within grooved and irregular, with accumulations of calcareous matter, the most remarkable of which are one under the posterior series of teeth, and a rib going to the middle of the truncated tip; cartilage pit a narrow cavity, which penetrates through the shell and forms a transverse fissure between the beaks, which are widely separated; series of teeth strongly curved, fifteen before and twenty behind the beaks, short, very broad, and folded outwardly. Length, one inch; height, eleven twentieths of an inch; breadth, two fifths of an inch.

Fig. 469.



L. Jacksonii.

Found at the land-slip at Pride's Bridge, Presumpscot River, Westbrook, Maine, September, 1837; and also by Dr. C. T. Jackson at Augusta, while engaged in the geological survey of Maine, in honor of whom I have named it. Greenland (*Mörch*, *Möller*); Labrador, abundant (*Packard*).

It is remarkable for its great width, which makes it almost cylindrical. The concentric lines are finer and closer than in *N. minuta* of first edition. In general outline it resembles *N. rostrata*, Sowerby, "Conch. Illust." Fig. 12. The denticulated boundary line of the beaks, both before and behind, is very peculiar. [Caused by an erosion so as to show the origin of the hinge denticles.

This shell, known to me as a fossil only, proves to be living abundantly in more northern seas, and has been described in Europe under the specific name *buccata*. It varies considerably in its proportions, so that Möller has designated two varieties, viz.,—var. *brevis:* ovate, ventricose, lower margin strongly arcuate; var. *lævior:* moderately ventricose, greenish yellow, rather smooth. It is more ventricose, less elongated and more finely sulcated than *L. pernula*.

Leda minuta.

Shell pear-shaped, beaks tumid, rostrum very short, scarcely upturned, and squarely truncate, epidermis dusky.

Arca minuta, Fabr. Fauna Gr. 414. — Gmél. 3309.
Arca minuta Grœnlandica, Chemn. Conch. x. 351, figs. 1657, 1658.
Nucula parva, Sowerby, Conch. Ill. No. 12, fig. 7. — Reeve, Conch. Syst. pl. 85, fig. 7, — Hanley, Brit. Biv. 169, pl. 19, fig. 52.
Nucula minuta, Philippi, Zeits. f. Malac. 101 (1844).
Nuculana minuta, Mörch, Prod. Moll. Grœnl. 21.
Leda minuta, Möller, Ind. Moll. Grœnl. 17. — Hanley, in Sowb. Thes. iii. 114, pl. 228, figs. 61, 62.

Shell oblong, pyriform, tumid, beaks at anterior third, slightly elevated, obtuse, inclined inwards, anterior dorsal margin sloping so as to bring the somewhat acutely rounded point about midway to the base; posterior dorsal margin with about the same slope as the front, direct and slightly upturned very near the tip, which is very small and squarely truncate; ventral margin full and well-rounded, with a very slight emargination under the tip; dorsal face very broad, with a wide, flattened, or somewhat depressed space, destitute of riblets, in front of the beaks, and a long lanceolate one defined by a sharp ridge behind; disks of the valves very tumid, with a shallow sub-marginal channel behind; surface deeply grooved concentrically, so as to form conspicuous reflexed riblets, which terminate on reaching the dorsal areas; epidermis dusky chestnut. Interior slightly nacreous, showing the external riblets, with a very distinct sharp ridge running from under the beaks to the middle of the tip; hinge with a very small, oblique ligament pit, with about twelve teeth before and fourteen behind it. Length, one half inch; height, three tenths of an inch; breadth, one fourth of an inch.

Fig. 470.

L. minuta.

Sent to me in considerable numbers from Halifax, by Mr. Willis.

No little confusion in the synonymy of this shell, in consequence

of regarding two very distinct forms as varieties of the same species. They were so described in the British Mollusca by Forbes and Hanley. I think there is good reason to follow the subsequent determination of Mr. Hanley as given in Sowerby's Thesaurus, and designate two species. This form is the more northern one, which I had not seen when the former edition was published. It corresponds with specimens sent me under this name by McAndrew and Mörch. It is distinguished by its swollen and abbreviated form, pouched ventral margin, and dark epidermis. The younger ones (var. *complanata*) are more compressed and longer beaked.

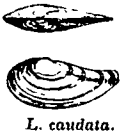
Leda caudata.

Long and slender, compressed, gradually tapering backwards, and decidedly falcate; beaks acute; epidermis wax yellow, concentrically furrowed.

Arca minuta, MONTAGU, Test. Brit. 140; id. Chenu ed. 61.
Arca caudata, DONOVAN, Br. Sh. pl. 78; id. Chenu ed. 50, pl. 17, figs. 8–12.
Nucula minuta, TURTON, Brit. Biv. 178. — HANLEY, Recent Shells, i. 168, pl. 10, fig. 44.
Nucula rostrata, SOWERBY, Gen. fig. 5. — McGILLIV. Moll. Aberd. 245.
Lembulus sulcatus, LEACH, Moll. Brit. pl. 12, figs. 3, 4.
Leda caudata, LOVÉN, Ind. Moll. Scand. 34. — FORBES and HANL. Br. Moll. ii. 226, pl. 47, figs. 11–13; pl. P. fig. 2 (animal). — HANLEY, in Thes. Conch. iii. 114, pl. 228, fig. 60. — GRAY, Cat. Br. Moll. 66 (part). — ALDER, Cat. Moll. Northumb. 79.
Leda complanata, MÖLLER, Ind. Moll. Grœnl. 17.

Perhaps the best way to delineate this species is to say that it is intermediate between *L. tenuisulcata* and *L. minuta*. Compared with *L. tenuisulcata*, which it most resembles, it is much smaller; the beaks are more acute, the umbonal region less tumid, the posterior portion more recurved, being quite falcate in consequence of concave outline of the dorsal margin, while that of *L. tenuisulcata* is nearly direct. From *L. minuta* it differs in its want of obesity, its much longer rostrum and its wax yellow epidermis. Length, three fifths of an inch; height, one fourth of an inch; breadth, three twentieths of an inch.

Fig. 471.



L. caudata.

The only specimens I have seen were received from Mr. Willis of Halifax; Greenland (*Mörch* and *Möller*). It is a more southern form than *L. minuta*.

FAMILY UNIONIDÆ.

SHELLS fluviatile; hinge having a simple or divided, furrowed, cardinal tooth, with or without a long marginal tooth; and sometimes destitute of teeth; muscular impressions compound.

Animal with the mantle adhering between the two openings, of which the upper one is plain and the lower fringed; foot very large; gills long, sub-equal, united posteriorly.

The shells embraced in this family are familiarly known by the names of *fresh-water clams* or *mussels*. They inhabit most, if not all, of our collections of fresh water, whether still or of rapid flow. Their aspect is peculiar, and there is such a stamp of identity upon them as forbids their being confounded with any other family of shells. Exteriorly they seldom present anything very attractive; but no one can fail to admire the beautifully tinted pearl of their interior. The few species inhabiting New England are simple and unpretending in their appearance; but our western waters furnish species infinite in the variety of their shapes, colors, and marking; and no shells are more eagerly sought for by foreign collectors than the American *Naiades*.

The teeth, when they exist, are strong, pyramidal, or compressed, and appear as if they had been abruptly fractured at their tips. The beaks of mature shells are almost always found to be eroded, either by the gravel or other substances which are washed over them, or by some chemical process. The foot of the animal is tongue-shaped, and serves to perform no inconsiderable journeys. In quiet water, where there is a layer of mud at the bottom, the furrows, traced by dragging the shell along on its sharp edge, are readily seen.

All the species are capable of producing pearls; and occasionally some of no inconsiderable beauty and value are found. Old and deformed shells are most likely to contain them; and in fact they seem to be the products of injury or disease.

The animal, in all the genera included in this family, seems to have the same organization; and the teeth, on the arrangement of which the genera are founded, are observed to dwindle from their greatest number and fullest development in such a continued series, until they wholly vanish, as to lead to the belief that all the *Unionidæ* might be reduced to a single genus.

[The young are found to attach themselves by a byssal thread, like the *Mytilidæ*, which this family every way resembles. The females are distinguished by being much more full and somewhat pouched at the posterior ventral margin; and the embryonic young are carried in the folds of the outer gills. Rafinesque and Swainson have proposed many generic divisions, and others founded on

the hinge or the form of the shell; and more recently Professor Agassiz has proposed several genera, not yet published, founded on the peculiarities of the animal, especially of the mantle and the parts of the gills which carry the embryos.

Genus UNIO, Retzius. 1788.

Shell equivalve, inequipartite, multiform; hinge with a stout, irregular, striated, simple or divided cardinal tooth in each valve, and an elongated, compressed, marginal tooth; gills free from the abdominal sac, their posterior extremity attached to the mantle; eggs filling the whole extent of the outer gill; upper siphonal opening somewhat fringed.

Unio complanatus.

Figs. 68, 69, 70.

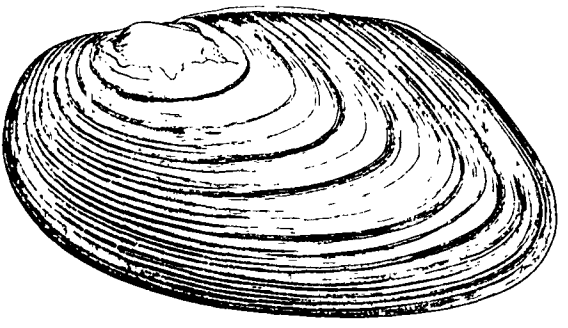
Shell elongated ovate, somewhat angular posteriorly, inequipartite; beaks not much elevated, epidermis dark brown; interior purple or salmon-colored; hinge-teeth deeply striated, pyramidal.

Mya complanata, Solander, MSS., Portland Catal. 100. — Dillwyn, Catal. i. 51.
Unio purpureus, Say, Nich. Encyc. (Amer. 1st ed.) iv. 3, fig. 1 (1816). — Deshayes, Encyc. Méth. Vers., ii. 581, pl. 249, fig. 5. — Barnes, Silliman's Journ. vi. 264.
Unio purpurascens, Lamarck, An. sans Vert. 2d ed. vi. 535.
Unio violaceus, Spengler, in Guérin's Mag. 26.
Unio rarisulcata, coarctata, rhombula, carinifera, Georgina, glabrata, and *sulcidens* of Lam. (An. sans Vert. vi.) on the authority of Lea.
Unio fluviatilis, Green.
Unio complanatus, Lea, Naiades, i. 30; Trans. Amer. Phil. Soc. (new series) iii. 416 (1830); vi. 130, not of Deshayes. — De Kay, Nat. Hist. N. Y. 188, pl. 22, fig. 246.

Shell very variable in form, usually oblong-ovate, sometimes sub-rhomboidal or sub-oval, very inequilateral, broadest behind, rather compressed. Beaks about the anterior fourth of the shell, little elevated, always much eroded, and exhibiting numerous layers of greenish epidermal matter; anterior extremity always regularly rounded; superior margin, behind the beaks, straight and somewhat ascending for one half its length, then, suddenly declining, it forms an indefinite angle; posterior end pointed, rounded or slightly clipped; inferior margin regularly curved, or sometimes a little arched at the middle; an obtuse ridge passes from the beaks to the posterior tip. Surface coarsely wrinkled by the lines of growth, and covered by a dark, tar-colored, or very dark-green epidermis.

Interior usually of a beautiful dark peach-blossom color, and passes from this through salmon-color to mother-of-pearl, tinged violet. Hinge having a single erect, pyramidal, coarsely striated cardinal tooth in the right valve, with the vestige of a tooth before, and a pit behind it; on the left valve are two nearly equal teeth of a tri-

Fig. 472.



U. complanatus.

angular, pyramidal form, the space between them corresponding to the opposite tooth; lateral teeth compressed, long, very slightly curved. Ordinary length, three and one half inches; height, two inches; breadth, one inch.

This is the most common fresh-water mussel we have. It is found in every considerable brook or collection of water emptying into the Atlantic; and it is said never to be found in any of the streams beyond the Atlantic slope.

It is perhaps the most variable of all species, as we may judge by noticing the numerous species which, according to Mr. Lea, Lamarck made of its varieties. And it is to be feared that Mr. Lea himself has not entirely avoided this error. Certain it is, that shells answering well to his *Roanokensis*, *jejunus*, and some others, are not seldom found in Massachusetts, among the indisputable *complanatus*.

The shell is always rounded before, somewhat widened and angular behind, and slightly truncated at tip, especially if viewed inside. Nor is it ever much inflated. Its true form is transversely oblong-oval; but is often nearly oval, and sometimes is much curved. In one specimen before me the height is five eighths the length, and in another it is only two fifths. In this latter the breadth is one fourth the length, while in a third it is nearly one half. The epidermis is usually coarsely wrinkled, without lustre, and of a pitchy black

color; but I have a series of a strongly marked variety from the Shawsheen River in Andover, where the color is dark chestnut with considerable lustre, the young shells are radiated with dark lines almost as much as *U. radiatus*, and some of the old shells are very coarsely plaited from the beaks downwards into parallel folds.

The only New England species with which this is liable to be confounded are *U. nasutus* and *U. radiatus*. The first differs, externally, in its more smooth, greenish, and somewhat radiated epidermis; the angular ridge running from the beaks backwards, produced by the strong compression of the hinge-margin; and by a contraction of the basal margin, near its posterior termination, so as to form a sort of beak; and internally by the silvery, iridescent nacre, and the slender, very oblique, cardinal teeth. *U. radiatus* has the hinge very nearly the same as *U. complanatus;* but the nacre is white, or somewhat livid, the shell never becomes so large, is more regularly convex; the epidermis is nearly smooth, shining, and yellowish-green, with conspicuous rays of olive color.

Unio nasutus.

FIG. 71.

Shell transversely oblong-lanceolate, hinge-margin compressed, anteriorly rounded, posteriorly somewhat beaked; epidermis dusky-green, obscurely rayed; cardinal teeth compressed, oblique; nacre very bright, bluish-white, iridescent.

Unio nasutus, SAY, Nich. Encyc. (Amer. 1st ed.) iv. pl. 4, fig. 1 (1816). — CONRAD, Unionidæ, 38, pl. 18, fig. 1. — DE KAY, Nat. Hist. New York, 191, pl. 20, fig. 239. — LEA, Synops. 37. — CONRAD, Synops. in Proc. Ac. Nat. Sc. vi. 252.

Mya nasuta, WOOD, Index, Suppl. pl. 1, fig. 4.

Unio rostratus, VALENC. Recueil d'Obs. de Zool., &c., par Humb. et Bonpl. ii. 233, pl. 53, fig. 3.

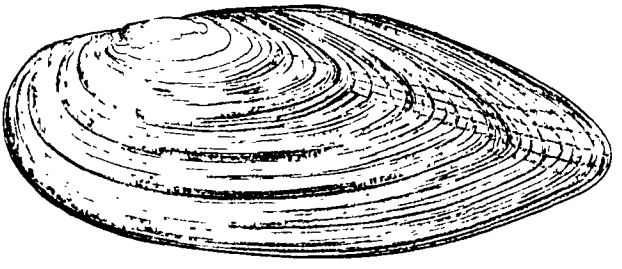
Eurynea nasuta, STIMPSON, Shells of New England, 13.

LISTER, Conch. t. 151, fig. 6.

Shell slender, oblong-lanceolate, very inequilateral; beaks small, pointed, and slightly elevated; hinge-margin straight to more than half the distance from the beaks to the posterior end, when it suddenly declines and continues straight to the point; lower margin nearly parallel with the upper, though somewhat rounded at the middle, and towards the end turns rapidly upward towards the point, which is considerably produced, so as to form a sort of snout. An angular ridge passes backwards from the beaks to the tip, above which the shell is very much compressed; two or more radiating furrows are usually seen traversing this portion. Surface rather smooth, not much wrinkled by the lines of growth. Epidermis

somewhat glossy, of a dark olive-green color, which in old shells becomes quite dusky, with darker and lighter zones alternating, and delicate, rather obscure rays of dusky. Within silvery-white, iridescent, and oftentimes with shades of bluish or salmon-color. Hinge with the cardinal teeth rather delicate, compressed, and di-

Fig. 473.



U. nasutus.

rected obliquely forwards, so as to look to the middle of the front. Cavity of the beaks small. Length, three inches; height, one and one fourth inches; breadth, four fifths of an inch.

This species is rather rare. I have found it in Fresh Pond, Cambridge, and have received it from the ponds in Plymouth. Mr. T. J. Whittemore found several good specimens in the Middlesex Canal, not far from Charlestown. It is more common in the Middle States.

It is not difficult to distinguish this from any of the species found in Massachusetts. The prolongation of the posterior extremity, which is made more conspicuous by a contraction of the basal margin just before the tip, and its compressed and oblique teeth, are well-marked characteristics. But it is not so easy to distinguish smaller specimens of this from those of *U. rectus* and *U. gibbosus*, as the general form is the same, and the prolongation of the tip is not then very remarkable.

Unio radiatus.

Fig. 73.

Shell transversely oblong-ovate, broadest and angular behind, inequilateral; epidermis wrinkled, brownish-olive, zoned and rayed with dusky-green; within bluish-white; cardinal teeth strong, erect, pyramidal.

Mya radiata, Gmelin, Syst. 3220. — Dillwyn, Catal. i. 51. — Wood, Gen. Conch. 109.
Unio radiata, Lamarck, An. sans Vert. vi. 535. — Deshayes, Encyc. Méth. Vers. ii. 581.

Unio radiatus, Barnes, Sillim. Journ. vi. 265 (young *cariosus*). — Hildreth, Sillim. Journ. xiv. — Lea, Trans. Amer. Phil. Soc. iii. 415; vi. 127, pl. 15, figs. 48, 49 (animal); Synops. Naiad. 25. — Conrad, Unionidæ, 24, pl. 10, fig. 2; Synops. Proc. Ac. Nat. Sc. vi. 256. — De Kay, Nat. Hist. N. Y. 189, pl. 18, fig. 236. — Gould, Invert. 110, fig. 72.

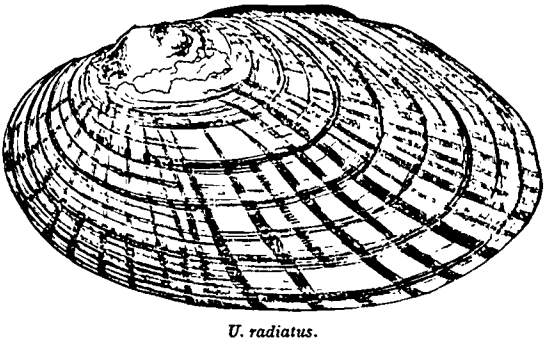
Unio Virginiana, Lam. An. sans Vert. 2d ed. vi. 544. — Deless. Recueil, pl. 13, fig. 4.

Mya oblongata, Wood, Suppl. pl. 5, fig. 2.

Lampsilis radiata, Stimpson, Shells of New England, 13.

Shell oblong-ovate, broadest and angular behind, beaks near the front, little elevated; epidermis loosely and delicately wrinkled concentrically, olivaceous, with numerous rays of dusky-green; sometimes the wrinkles are also disposed in a radiated manner. Hinge-margin a little angular at the beaks; anterior extremity narrow, about one fourth the length of the shell, regularly rounded, but the hinge-margin turns downwards with a very abrupt curve; posterior side angular above, rounded at tip; hinge-margin very little compressed; basal margin regularly curved. Interior white, iridescent posteriorly, with sometimes bluish or flesh-colored tints. Cardinal teeth erect, triangular, pyramidal, strengthened by a stout rib behind the anterior muscular impression. Length, three inches; height, one and seven tenths inches; breadth, one and one fifth inches.

Fig. 474.



U. radiatus.

This is one of our common species, and is to be found in most of the large streams and ponds. It is also one of the shells confined to the eastern slope of the range of Alleghanies.

It exhibits but little variation in form, except the usual one, that those inhabited by the female are broader behind than those inhabited by the male.

No species is now better established than the one above described, though there is good reason to believe that the *U. radiatus* of Barnes, Dillwyn, Wood, and perhaps Say, was the young of either *U. cariosus* or *U. ochraceus*, or both. It is most likely to be confounded with *U. siliquoideus;* but that shell has the epidermis lighter col-

ored, very closely adhering, and perfectly smooth and glossy; the teeth also are more compressed and more oblique. Mr. Barnes observes of it that, "amidst a variety almost infinite, like that of the human countenance, there is still a characteristic identity of this species, which can scarcely be mistaken by an experienced observer. One variety of *radiatus* approaches nearest to this species, but the least appearance of rays forbids its association." This last remark is far from being just.

Unio cariosus.

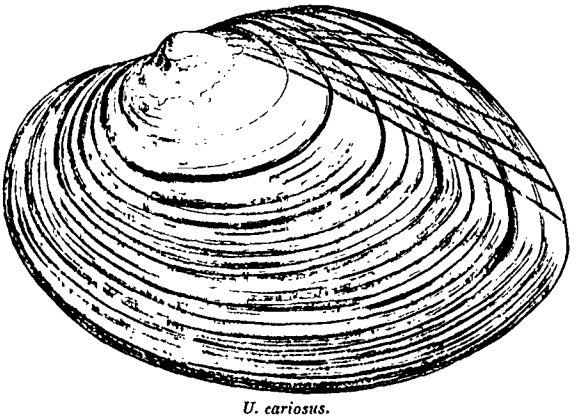
FIG. 72.

Shell ovate, inflated, not very thick, inequilateral, beaks rather prominent; epidermis yellowish-olive, usually radiated with dark-green; within usually bluish-white; teeth compressed, oblique.

Unio cariosus, SAY, Nich. Encyc. (Amer. ed. 1816) iv. pl. 3, fig. 2. — BARNES, Silliman's Journ. vi. 271. — LEA, Trans. Amer. Phil. Soc. (new series) vi. 126, pl. 15, fig. 45 (animal); Synops. Naiad. 27. — DE KAY, Nat. Hist. New York, 193. — GOULD, Invert. 111, fig. 72.
Unio cariosa, LAMARCK, An. sans Vert. 2d ed. vi. 545.
Unio ovata, VALENC. Recueil d'Obs. de Zool. par Humb. et Bonpl. ii. 226, pl. 50, fig. 1.
Unio cariosus, CONRAD, Unionidæ, 40, pl. 19. — KÜSTER, Suppl. Chem. pl. 24, figs. 1–3.
Musculus latior subfuscus, cæruleis lineis radiatus, LISTER, Conch. 152, fig. 7.
Lampsilis cariosa, STIMPSON, Shells of New England, 14.

Shell very variable in form, ovate or rounded, moderately thick, inflated; beaks placed at the anterior third, rather prominent, usu-

Fig. 475.



U. cariosus.

ally very much eroded; hinge-margin straight, ascending from before backwards; anterior end narrow, regularly rounded; posterior end regularly curved above and below, and in the male terminating

in a distinct angle, but in the female very broadly rounded; a sharp ridge usually passes from the beaks towards the posterior tip. Surface considerably undulated by the lines of growth; epidermis smooth, shining, and sometimes with rays of minute wrinkles; color dull greenish-yellow or light olive, usually with rays of bright, dark green, especially along the upper posterior margin. Interior bluish-white, with sometimes a flesh-colored tint. Cardinal teeth compressed and oblique; lateral tooth rather short; cavity of the beaks rather large. Length, three inches; height of male, one and three fourths inches, of female, two and one fourth inches; breadth, one and one fourth inches.

Found in the Connecticut River and its tributaries, and in ponds in Plymouth County.

It is very difficult to fix upon characters which shall indicate this shell, its variation in shape is so great. When young, it is thin and beautifully radiated, and not easily distinguished from the young of *U. ochraceus;* and at maturity no species presents a greater contrast between the male and female than this. As found in this region it is quite thin, and radiated only along the posterior margin; but in the waters south of New England, it becomes larger and more solid.

Unio ochraceus.

Fig. 74.

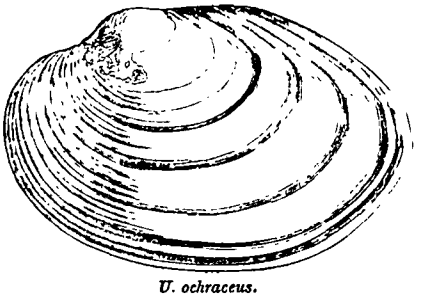
Shell oblong, sub-ovate, inflated, thin, inequilateral, angular behind; epidermis loosely wrinkled posteriorly, yellowish-green, finely radiated with olive; cardinal teeth compressed, nearly parallel with the margin; within salmon or rose-colored.

Unio ochraceus, Say, Nich. Encyc. (Amer. ed. 1816) iv. pl. 2, fig. 8. — Lea, Trans. Amer. Phil. Soc. (new series) vi. 126, pl. 15, fig. 44 (animal); Synops. Naiad. 23; 3d ed. 27. — Conrad, Unionidæ, 37, pl. 17, fig. 2; Synops. Proc. Ac. Nat. Sc. vi. 254. — De Kay, Nat. Hist. New York, 193, pl 19, figs. 137, 138. — Gould, Inv. 112, fig. 74.
Symphynota ochracea, Lea, Trans. Amer. Phil. Soc. (new series) iii. 69.
Pectunculus fluviatilis, Lister, Conch. pl. 157, fig. 12.
Lampsilis ochracea, Stimpson, Shells of New England, 14.

Shell transversely oblong, sub-ovate, thin, translucent, very much inflated; beaks more than one third from the front, elevated, inclined forwards and touching at the points; hinge-margin straight, ending in an angle both anteriorly and posteriorly; anterior end narrowest, compressed, especially above, rounded, and widely gaping; posterior end having its point angular in consequence of a sharply angular ridge which passes from the beaks and terminates there,

and encloses a broad, depressed space, with the margins compressed into a keel; base regularly rounded. Surface tolerably regular; epidermis lying in fine loose folds about the posterior end, color olivaceous, rather yellowish in shells of the ordinary size, and finely radiated and zoned with dark olive over every part of the shell. Interior a very delicate rose-color, or deep salmon-color, tinted with rose-red. Cardinal teeth compressed, striated, directed forwards, and nearly parallel with the hinge-margin; lateral teeth short; cavity of the beaks capacious. Length, two and three fourths inches; height, two inches; breadth, one and one fourth inches.

Fig. 476.



U. ochraceus.

Some specimens are found much larger. I have one from Pennsylvania which measures four inches, two and two fifths inches, one and three fourths inches. Such shells become quite thick and proportionally elongated posteriorly; they lose the radiations of the epidermis, which is of a dark olive-color. I do not know that any such shells have been found in Massachusetts.

This shell is very rare, and I do not know of its having been found anywhere except in Plymouth ponds. When young it is scarcely to be distinguished from *U. cariosus;* but it is more inflated, and the radiations of the epidermis are finer, and cover more of the shell; nor is it so glossy, and its interior is more colored.

Genus MARGARITANA, Schumacher. 1817.

Shell transverse, inequilateral; hinge like that of *Unio*, except that it is destitute of a lateral tooth.

Margaritana arcuata.

Fig. 75.

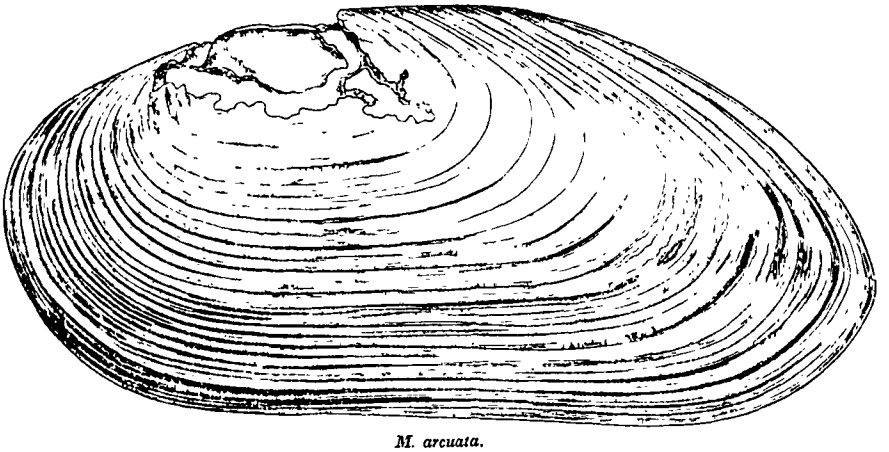
Shell more or less kidney-shaped, very inequilateral, thick, beaks not prominent; epidermis pitchy-black; within bluish-white; teeth erect, conical, grooved.

Alasmodonta arcuata, Barnes, Silliman's Journ. vi. 277, pl. 12, fig. 20 (1823).—Adams, Shells of Vermont, in Thomps. Hist. 165.—Gould, Inv. Mass. 1st ed. 113, fig. 75.—De Kay, Nat. Hist. New York, 197, pl. 14, fig. 224.

Mya margaritifera? Lin., Dillwyn, Wood, &c.
Margaritana margaritifera, Lea, Trans. Amer. Phil. Soc. vi. 135; Synops. 3d. ed. 433, where a full synonymy may be found.
Margaritana arcuata, Stimpson, Shells of New England, 15 (1851). — Conrad, Synops. in Proc. Ac. Nat. Sc. vi. 262.

Shell transversely much elongated, ovate or kidney-shaped, thick and strong; beaks within the anterior fourth, scarcely rising above the line of the hinge, very much eroded; hinge and basal margins usually curved, nearly parallel; nearly as broad before as behind the hinge, and rounded; more pointed behind, and the tip appears as if slightly truncated; surface somewhat waved by the lines of growth; epidermis close and smooth upon the disk, loosely wrinkled towards the margin and posteriorly, color pitchy-black. Within smooth, bluish-white, and sometimes tinted flesh-color at the centre; nacre not extending to the margin, leaving a greenish border. Cardinal

Fig. 477.



M. arcuata.

teeth two in the left valve, erect, strong, pyramidal, the posterior one deeply grooved in front so as to form four or five denticles along its edge; one on the right valve, long, erect, a little twisted, deeply grooved along its front, and with a pit each side, at base; cavity of the beaks shallow. Length, four and one half inches; height, two inches; breadth, one and one fourth inches.

Found in most running streams in the interior; I have never found it near the seaboard.

It is a very common shell, and is at once known by its curved form, dark color, and the want of a lateral tooth. It is the largest fresh-water mussel we have.

Mr. Lea regards our shell as identical with the European *Mya margaritifera* of the older authors, the *Unio elongata* of Lamarck, &c.; but the shells which I have had an opportunity of examining present some constant differences. The foreign shell is shorter, the beaks more nearly central, and more elevated, and the portion of the interior, within the pallial impression, is minutely granulated; and as my foreign specimens agree accurately with the figures of Chemnitz and Turton, I am induced to think there may be a constant difference. The intervention of an ocean would strengthen the supposition. I have, therefore, felt disposed to retain the very appropriate name of Barnes, until more fully satisfied. The European shell is the famous river *pearl-mussel*, in which pearls of considerable beauty are occasionally found. But, as far as I have observed, they are not oftener found in our *Alasmodon* than in other species of fresh-water mussels.

Margaritana undulata.

FIG. 76.

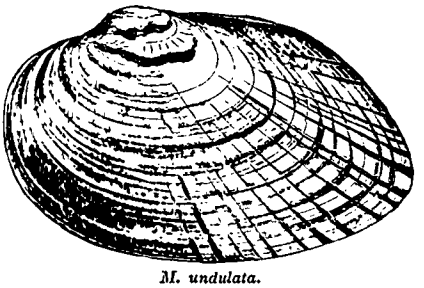
Shell transversely-ovate, inequilateral, angular behind; beaks tumid, elevated, undulated; epidermis dark-green, obscurely rayed; one cardinal tooth in each valve, supported by a strong internal rib.

Unio undulatus, SAY, Nicholson's Encyc. (Amer. ed.) iv. pl. 3, fig. 3 (1816). — BINNEY's reprint, 53, pl. 71, fig. 3.
Alasmodonta undulata, BARNES, Silliman's Journ. vi. 279 (1823). — ADAMS, Shells of Vermont, in Thomps. Hist. 165.
Mya undulata, WOOD, Suppl. pl. 1, fig. 5.
Margaritana undulata, LEA, Trans. Amer. Phil. Soc. (new series) vi. 135; Synops. Naiad. 44; 3d ed. 42.
Unio hians, VALENC. Recueil d'Obs de Zool. par Humb. et Bonpl. ii. 235, pl. 54, fig. 2.
Alasmodon undulata, SWAINSON, Lardner's Cab. Cyclop. cxxiii. 288, fig. 61.
Strophitus sculptilis, STIMPSON, Shells of New England, 15 (1851). — The young, LEA.

Shell transversely-ovate, strong, much inflated, widely gaping; beaks at the anterior third, very prominent, tumid, with three or four large, concentric, oblique undulations upon them; anterior and basal margins broadly and regularly curved, with a very slightly lobed appearance in front of the beaks; posterior margin angular behind the ligament, and pointed at tip, rapidly narrowed; ligamentary area imperfectly marked by an ill-defined ridge, which is usually wrinkled in the direction of its course; margin compressed. Surface a good deal undulated by the stages of growth; epidermis shining, of a dark olive-color, everywhere rayed with fine lines, al-

ternately yellowish and dark, which are not very conspicuous unless held up to transmitted light. Within, the anterior half is thickened, opaque, and the color white; the posterior half is translucent, thin, of a silvery lustre, exhibiting the exterior radiations. Hinge supported on a very strong rib, tooth of the right valve erect, conical, striated above; tooth of the left valve erect, produced backwards in a triangular manner, under the ligament, with a pit in front of it; cavity of the beaks very deep and capacious. Length, two inches; height, one and two fifths inches; breadth, one inch.

Fig. 478.



M. undulata.

Found in Blackstone River and its tributaries, and in Plymouth County.

It is easily known by its short, tumid appearance, the undulations on the beaks, and the peculiar hinge.

Margaritana marginata.

Fig. 77.

Shell transversely-ovate, wedge-shaped, inequilateral; beaks prominent; umbonal ridge elevated; surface wrinkled posteriorly; epidermis olivaceous, imperfectly radiated with dark green; tooth small, compressed, looking forwards; nacre bluish-white, with a chalky-white margin.

Alasmodonta marginata, Say, Journ. Acad. Nat. Sc. i. 459. — Barnes, Silliman's Journ. vi. 279. — Conrad, Synops. in Proc. Ac. Nat. Sc. vi. 262. — Stimpson, Shells of New England, 15. — Adams, Shells of Vermont, in Thomps. Hist. 165.

Unio varicosa, Lam. An. sans Vert. vi. 78; 2d ed. vi. 543.

Alasmodon marginata, De Kay, Nat. Hist. New York, 196, pl. 14, fig. 225. — Gould, Inv. 116, fig. 77.

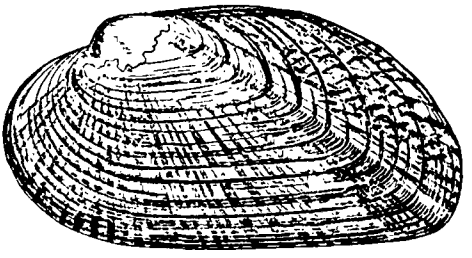
Margaritana marginata, Lea, Trans. Amer. Phil. Soc. (new series) vi. 135; Synops. 3d ed. 42.

Mya rugulosa, Index, pl. 1, fig. 7.

Shell ovate, thin, widely gaping behind, wedge-shaped from before backwards; beaks at the anterior third, rather small, but elevated, and having three or four small undulations; anteriorly low and rounded, but increases rapidly in height; the posterior hinge-margin suddenly declines to form a rounded tip; ridge from the

beaks elevated and well-defined, above which the shell exhibits coarse, rounded wrinkles, running obliquely upwards and backwards; cipdermis shining, olive-green, somewhat mottled with dark and light shades, and with obscure, broken, radiating lines; within bluish-white, with shades of green, the margin chalky-white. Hinge delicate, the teeth, one in each valve, small, compressed, directed along the hinge-margin so as almost to coincide with it; sometimes the teeth are only rudimentary; cavity of the beaks rather deep, not very capacious. Length, two inches; greatest height, one and one tenth inches; breadth, nine tenths of an inch.

Fig. 479.



M. marginata.

Found in the Blackstone River and its tributaries, and in Shawshin River, Andover. I have also received very beautiful specimens from a pond in West Brookfield.

It is not common, and may be readily distinguished from our other species by its wedge-like form, when seen from above, by the remarkable series of oblique wrinkles along the posterior slope, and by its delicate teeth, which, in fact, sometimes wholly disappear. In the character of its wrinkles it is much like *M. rugosa*. It is more elongated than *M. undulata*, and has its greatest height at the posterior termination of the hinge, instead of opposite the beaks, as in that shell.

Mr. Lea regards our shell as being the same as the western shell named *M. truncata* by Say. Some of our specimens approach it very closely, but ours is in general a less inflated, less angular shell.

Genus ANODON, (Brug.) Cuvier. 1798.

Shell transversely elongated, inequilateral, thin; hinge toothless.

Anodon fluviatilis.

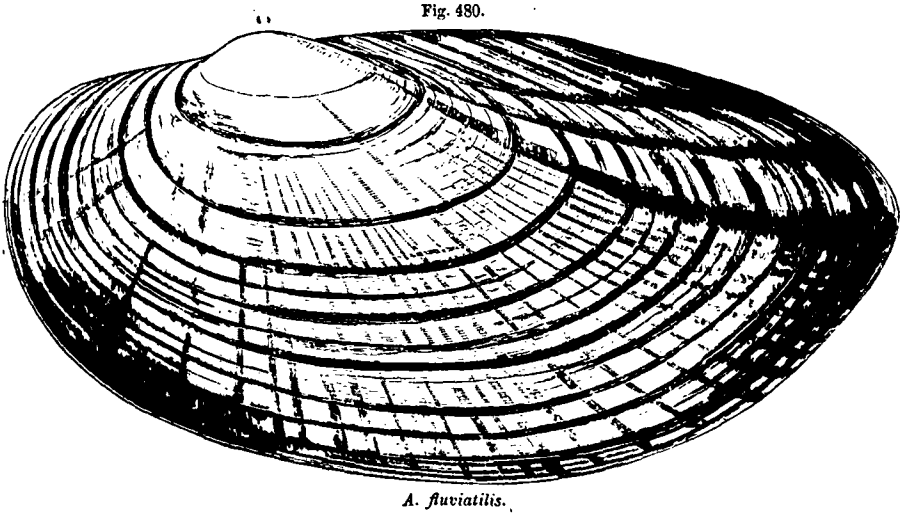
Fig. 80.

Shell thin, inflated, transversely sub-oval, hinge-margin straight, crested behind; beaks moderately elevated, epidermis deep grass-green, obscurely rayed, darker above the posterior ridge: within white, tinted lilac.

Anodonta cataracta, SAY, Nicholson's Encyc. (Amer. ed.) iv. pl. 3, fig. 4 (1816).
Anodonta fluviatilis, LEA, Trans. Amer. Phil. Soc. (new series) vi. 138; Synops. Naiad. 51. — STIMPSON, Shells of New England, 15.
Mytilus illitus, SOLANDER, Portland Catal. 163.
LISTER, Conch. t. 112.

Shell transversely sub-oval, sub-cylindrical, thin, fragile, inflated; beaks at the anterior two fifths of the shell, tumid, somewhat elevated, and minutely undulated at tip. Hinge-margin straight; anterior imperfectly angular above, nearly as high as behind the beaks; upper posterior margin forming an obtuse angle at the termination of the ligament, and declining in a straight line to form a somewhat produced, blunted point; this margin is compressed into a sort of

Fig. 480.



A. fluviatilis.

crest; basal margin a good deal curved; surface undulated somewhat irregularly by the lines of growth; epidermis smooth and close except at the upper and posterior portion, where it is loosely wrinkled; a few radiating series of wrinkles may also be seen; color a deep grass-green, becoming dusky behind and above, and obscurely radiated. Nacre silvery, or tinged with bluish or yellowish, margin greenish; cavity of the beaks not deep, large; hinge edge very thin, rounded, scarcely curved. Length, four and one half inches; height, two and three fourth inches; breadth, one and one half inches.

Inhabits ponds in the western and central parts of this State, and is seldom found in any other part. Professor Adams, however, assures me he has found it at Falmouth, and I have collected a few specimens from clay-pits near Winter Hill, Charlestown.

It greatly resembles the *A. cygnea* of Europe, and is chiefly distinguished by the latter having the beaks less central, and not at all elevated. From the next species the most obvious distinctions are, the bright green-color, together with the thinness of the shell. It is very difficult, if not impossible, to draw the line between our shell and some of the species of the western waters. They seem, most of them, to be mere variations in size.

Anodon implicata.

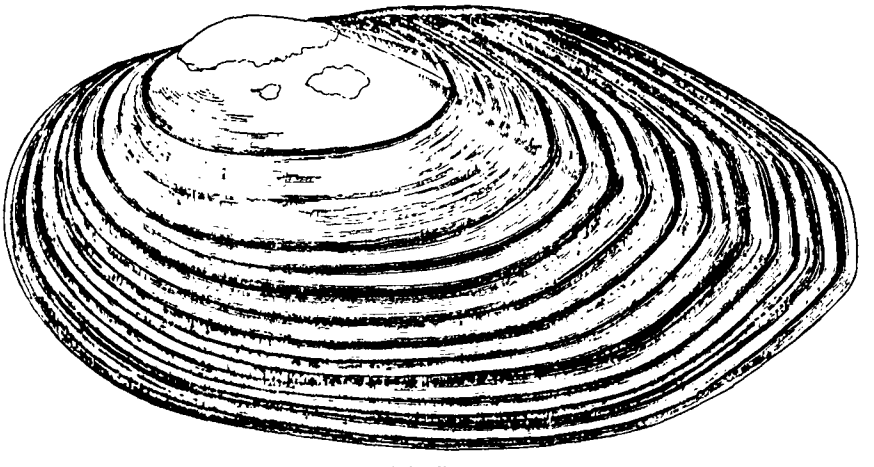
FIG. 78.

Shell transversely oblong, sub-oval, variable in proportions, thick and strong, exterior coarse; epidermis yellowish-olive; nacre flesh-colored.

Anodonta implicata, SAY, New Harmony Disseminator, 340 (1829); Mrs. SAY's reprint, 11; BINNEY's reprint, 138. — CONRAD, Synops. in Proc. Ac. Nat. Sc. vi. 264. — LEA, Synops. 3d ed. 50. — STIMPSON, Shells of New England, 15.
Anodonta Newtoniensis, LEA, Trans. Amer. Phil. Soc. (N. S.) vi. 79, pl. 21, fig. 66 (1839).
Anodonta marginata? SAY (young), Nicholson's Encyc. Amer. ed. iv. pl. 3, fig. 5.
Anodon implicata, GOULD, Inv. 118, fig. 78. — DE KAY, Nat. Hist. New York, 202.

Shell transversely-oblong, sub-oval, almost as broad as high, sub-cylindrical, thick, opaque, strong and heavy; beaks removed about

Fig. 481.



A. implicata.

two fifths of the length of the shell from the anterior end, rather elevated, obtuse; breadth of shell greatest behind the middle; hinge-margin a little curved, forming an angle at both its terminations; the backward slope from this angle is usually a little curved,

and the posterior tip is rather blunt and somewhat truncated; the ridge from the beaks to this tip is very prominent, generally bluntly rounded, but sometimes quite abrupt; the space above it is rough, but is little compressed, except in young specimens; three or four coarse lines often run along this space in the direction of the ridge; basal margin very gently curved in young specimens, nearly parallel with the hinge-margin in the middle-aged, and deeply contracted or arched in old shells. Surface rough, with coarse and irregular lines of growth; epidermis yellowish-olive, darker above and behind, and with dusky-brown zones; young shells are of a delicate grass-green, slightly rayed. Interior silvery till after the middle age, when it becomes of a delicate flesh-color or salmon-color. Length, four inches; height, two and one fourth inches; breadth, one and seven twentieth inches. Of another specimen, four and one half inches; two and four tenth inches; one and nine tenth inches. Of another, three inches; one and six tenth inches; one and one tenth inches.

Inhabits ponds in Essex and Middlesex counties, and is also found in Maine; whether it occurs southward or not is uncertain. A Pennsylvania shell, which Mr. Lea describes under the name of *A. Newtoniensis*, is so much like some varieties of this shell as to render it probable that they are the same, and that it is found throughout a wide southern range.

The above is the description of a characteristic specimen of a shell which probably varies more in its form, color, and weight than any other *Anodon*. It is undoubtedly the *A. implicata* of Say, for it accords well with his description, and was received from a region where no other species is found. In their younger stages it is difficult to distinguish them from *A. fluviatilis;* but the great thickening near the margin which the adult undergoes, and its light-yellowish epidermis, render them entirely dissimilar. I have specimens in which portions of the valves are three tenths of an inch thick. At the middle age, some specimens so much resemble very old ones of *Unio radiatus*, that it is impossible to name them without examining the hinge. In the young, the beaks are delicately undulated, the hinge-margin is compressed and connate, and the angle at its posterior termination is very decided. Some specimens, of a middle size, lose all their angles, and the upper and lower margins are similarly curved. Some have a dark, tar-colored epidermis; these are generally very broad in proportion to their height.

Anodon undulata.

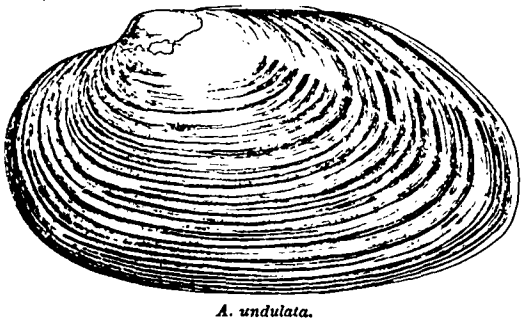
FIG. 79.

Shell transversely ovate, rather thick, beaks prominent, epidermis dark-brown, radiated, coarsely wrinkled; hinge-margin undulated, and with the vestige of a tooth.

Anodonta undulata, SAY, Nicholson's Encyc. Amer. ed. iv. pl. 3, fig. 6.—LEA, Synops. Naiad 50.
Anodon rugosus, SWAINSON, Zoöl. Illust. pl. 96.
Anodon undulata, GOULD, Inv. 120, fig. 79.

Shell oblong-ovate, thick and strong; beaks sub-central, elevated, the points in contact, and when not eroded they exhibit four or five small undulations upon them; before them is a spear-shaped pit or areola, not covered by the epidermis; behind them the margin is slightly compressed, and has two or three coarse, sub-marginal furrows; no distinct angle at the termination of the ligament; posterior end somewhat bluntly rounded; anterior end compressed, sharply rounded; basal margin regularly curved; epidermis dark-brown, radiated in most specimens, smooth, and closely adhering towards the beaks, but lying in numerous, rather loose folds near the margin; interior inclined to salmon-color, and granulated centrally, bluish-white outside of the pallial impression, with a broad margin of olive-color. Hinge-margin waved under the beaks, compressed on the right valve so as to form something like an elongated cardinal tooth, which is received into a corresponding recess in the left valve. Length, three and one half inches; height, two inches; breadth, one and one half inches.

Fig. 482.



A. undulata.

Found in the Blackstone River and its tributaries, of large size and great perfection.

It is impossible to be certain that this is *A. undulata* of Say, on account of the small size of the specimen he described; but it seems to be the shell which Mr. Lea regards as such. It seems to be a different thing from the shell described by Hildreth under that

name. I apprehend that it is the same as *A. edentula*, Say, and *A. areolatus*, Swainson. If there be any difference among them, it is that our shell is less compressed, less radiated, and less fragile than *A. edentula*. The hinge is the same, and the areole before the beaks is produced by a wave-like digression of the right valve to form a peculiar tooth. The young shells are thin, and much more radiated than the old ones, and the size of adults is seldom more than two thirds of the dimensions above given. It is one of the connecting links between *Alasmodon* and *Anodon*.

Family MYTILIDÆ.

Hinge with the ligament marginal, partly included, linear, extending along a great part of the posterior border. Shell rarely foliated; adheres by a byssus.

Genus MYTILUS, Lin. 1758.

Shell elongated, sub-triangular; beaks terminal, pointed, straight; hinge generally toothless; muscular impression elongated, club-shaped.

Mytilus edulis.

Fig. 82.

Shell ovate-triangular, beaks terminal and pointed, basal margin straight, ligament margin straight; posteriorly widened and rounded; hinge with a few denticulations; epidermis dark-bluish, shell violet beneath.

Mytilus edulis, Lin. Syst. Nat. 1157. — Gmélin, Syst. 3353. — Turton; Lin. iv. 291. — Chemn. Conch. viii. 169, t. 84, fig. 750. — Pennant, Brit. Zool. iv. 236, t. 66, fig. 2. — Montagu, Test. Brit. 159; Lin. Trans. vi. t. 18, figs. 13, 14. — Dillwyn, Catal. 309. — Turton, Conch. Dict. 109; Brit. Biv. 199, pl. 15, fig. 1 (*pellucidus*). — Deshayes, Encyc. Méth. Vers. iii. 562, pl. 218, fig. 2. — Knorr, Vergn. iv. pl. 15, fig. 4. — Lam. An. sans Vert. vii. 47. — Gualt, Test. t. 91, fig. E. — Donovan, Brit. Shells, ii. t. 128. — Wood, Index, pl. 12, fig. 21. — Fleming, Brit. Anim. 411. — Adams, Gen. ii. 510, pl. 121, fig. 1. — Möller, Ind. Moll. Gr. 19. — Gould, Inv. 121, fig. 82.

Mytilis vulgaris, Da Costa, Brit. Conch. 216, t. 15, fig. 5.

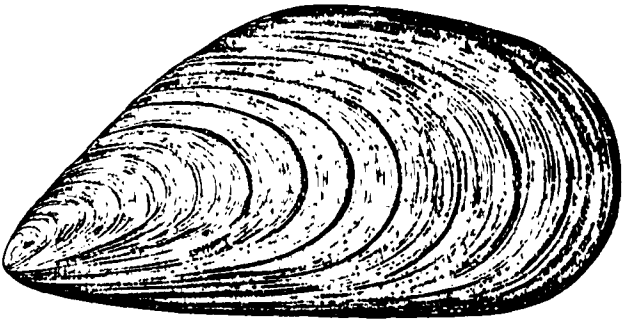
Musculus subcæruleus, Lister, Conch. t. 362, fig. 200.

Mytilus borealis, Lam. An. sans Vert. vii. 46. — De Kay, N. Y. Moll. 182, pl. 13, fig. 222. — Middend. Moll. Ross. 15, 27.

Shell triangular-ovate, solid, coarse, shining; beaks pointed, placed at one end, and slightly diverging; basal or anterior margin generally straight, sometimes slightly convex, and sometimes excavated; hinge-margin rising in a straight line unites with the

upper or posterior margin by a somewhat abrupt curve; this margin takes a direction parallel to the base, for a short distance, and then the two unite by a regular curve; an abrupt ridge passes from the beaks to the lower and hinder angle, above which the shell gradually slopes to a sharp edge, and below which it bends so abruptly

Fig. 483.



M. edulis.

as to present a broad, flattened space, in the centre of which is a slight fissure for the passage of a byssus. The shell itself is of a violet color; the epidermis is usually of a dark, shining blue-black. Within, the shell is white and silvery in the centre, but all the margin is a dark violet or blue-black. Under the beaks are about four thin, oblique denticulations, quite distinct when the overlapping epidermis is removed. Length, two and four tenths inches; height, one and three tenths inches; breadth, one inch.

Var. pellucidus.

Mytilus pellucidus, PENNANT, Brit. Zool. iv. 237, pl. 66, fig. 3. — MONTAGU, Test. Brit. 160. — MATON and RACKETT, Lin. Trans. viii. 107. — DILLWYN, Catal. 310. — TURTON, Conch. Dict. 110; Lin. Syst. iv. 292; Brit. Biv. 197, pl. 15, fig. 1. — CHEMN. Conch. viii. 84, fig. 751. — DONOVAN, Brit. Shells, 81. — WOOD, Index, pl. 12, fig. 22. — DE KAY, N. Y. Moll. 183, pl. 24, fig. 256. — KNORR, Verg. pl. 4, t. 15**, figs. 1, 2.

Shell smooth, thin, transparent, radiated with blue and horn-color; beaks with two or three teeth.

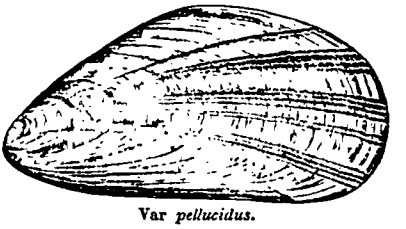
This beautiful variety has been regarded by many conchologists, such as those named above, as a distinct species, while others, with more apparent propriety, consider it as a variety, depending chiefly on age, of the true *M. edulis*. None of the specific marks given to it seem to be constant. Radiations appear in the solid old shell, as

well as in the thin ones; and, on the other hand, the thin ones are often without radiations. Turton thinks it may always be distinguished "by having only two or three tubercular teeth under the beaks." But this does not accord with my observations.

The shell is subject to many distortions from accident, and from the form of the bodies on which it grows, or of cavities in which it becomes wedged. Hence, probably, arises that curved form which takes the name of *M. incurvatus*.

This mussel is one of the most common and best known of all our shells. It is very extensively distributed throughout all northern seas. It is abundant on the coasts of England, France, Norway, and Russia, where it is extensively used as food, as its name imports, and also for manure. In this country it has, as yet, been put to no economical use, though I am assured by a friend of acknowledged good taste, that when cooked it is more palatable than the common clam. Unlike the *Modiola modiolus*, it appears to inhabit shallow waters, in positions where it is left uncovered at the recess of the tide. It attaches itself by its byssus to rocks and timbers, and may be thus seen under bridges and other submerged structures, in shallow inlets with a pebbly bottom, and especially on rocks not far from high-water mark, clinging in immense crowds of all sizes, colors, and figures; some beautifully radiated, some dark blue-black, and others light horn-color; some beautifully smooth, regular, and glistening, others distorted, rough, and dingy; the whole surface of the young shell is beset with a bristly beard. While, like the *Modiola plicatula*, it clusters about the shore, it does not, like that, bury itself in the mud, but is always exposed and attached to some solid body. It is common to find it wedged in among the rocks and crevices of such shores as Nahant and Cape Ann.

Fig. 484.



Var *pellucidus*.

Eastport, common (*Cooper*); Nova Scotia (*Willis*); James Bay (*Drexler*); Goodhaven (*Hayes*); fossil in the valley of the St. Lawrence.

Genus MODIOLA, Lamarck. 1799.

Shell oblique, wedge-shaped; beaks very near the anterior end; hinge as in *Mytilus;* impression of the mantle irregular.

Modiola modiolus.

Shell oblong-ovate, gradually widening from before backwards; hinge-margin ascending, straight for about half the length of the shell; beaks tumid, obtusely angular; epidermis dark chestnut-color.

Mytilus modiolus, Lin. Syst. Nat. 1158. — Pennant, Brit. Zool. iv. 239, t. 69. — Montagu, Test. Brit. 163. — Chemn. Conch. viii. 178, t. 85, fig. 759. — Knorr, Vergn. iv. t. 15, fig. 3. — Lister, Conch. t. 1057, fig. 5. — Dillwyn, Catal. i. 314. — Wood, Index, pl. 12, fig. 31; Lin. Trans. viii. 107. — Donovan, Brit. Shells, pl. 23. — Müller, Zool. Dan. ii. t. 53. — De Kay, N. Y. Moll. 185, pl. 24, fig. 257.

Modiola modiolus, Turton, Brit. Biv. 199, pl. 15, fig. 3 (young); Conch. Dict. 111. — Gould, Inv. 123.

Mytilus Papuanus, Deshayes, Encyc. Méth. Vers, iii. 564, pl. 219, fig. 1.

Modiola Papuana, Lam. An. sans Vert. vii. 17. — Blainv. Malacol. pl. 64, fig. 3. — Say, Am. Conch. pl. 45.

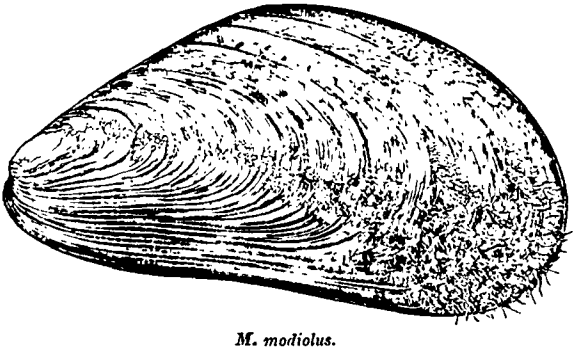
Modiola vulgaris, Fleming, Brit. Anim. 412.

Mytilus barbatus, Lin. Syst. Nat. 1156. — Donovan, Brit. Shells, pl. 70. — Montagu, Test. Brit. 161. — Pennant, Brit. Zool. iv. 238, pl. 67, fig. 2.

Mytilus umbilicatus, Donovan, Brit. Shells, fig. 40.

Shell large, thick, coarse and solid, ovate-oblong; beaks placed at one side, points inclined outwards, and projecting nearly as far

Fig. 485.



M. modiolus.

as the anterior extremity, which is very short and narrow; the upper edge is ascending, and straight about one half the length of the shell, when it curves gently downwards to the posterior extremity, which is obtusely rounded; the basal margin is somewhat arched upwards, and at the arched portion the shell is gaping for the passage of the byssus. From the beaks a very convex, broad ridge runs diagonally across the shell; above this the shell is compressed, and along its lower and anterior side is a broad depression or constriction, terminating at the lower margin where the shell gapes. Surface roughly marked by the lines of growth, and by a few faint, ra-

diating lines; epidermis thick and leathery, folding over the margin, of a chestnut or pitchy-brown color, smooth, glossy, and with radiating wrinkles before the ridge, where it is generally darker colored, while the ridge is lighter colored. The groove for the ligament is long and deep, resting upon a prominent rib. Interior pearly, of a somewhat livid color; muscular impressions large and deep; byssus colored like the epidermis. Length, four and one half inches; height, two and one quarter inches; breadth, two inches.

Inhabits deep water, and is thrown up on every shore exposed to the open sea. It probably dwells upon a rocky or pebbly bottom, as its byssus would find no attachment in mere sandy or muddy regions.

This shell is well known on account of its size and universal distribution along our coast. It often attains to a great size, and is not unfrequently seen six inches in length. Specimens are rarely found which are not in some way distorted. Hence the shells assume a great variety of form. The distortion seems to depend upon two causes: first, the body to which they are attached by the byssus, which may modify the form of the basal margin, rendering it more or less arched; and second, the frequent injuries sustained by being dashed about by storms among the rocks which they inhabit. They are the more liable to accidents of this kind, in consequence of their affording attachment to the *Laminaria*, and other large sea-weeds, which, being acted upon by the violence of the waves, tear the shells from their resting-places, and they are thus dragged great distances. In fact, it is not usual to find a specimen on the beach without some parasite attached. A common deformity occurs at the posterior or broader end, by what would seem to be an arrest of development. The growth does not go on in this direction, the successive layers extending very little beyond each other, and thus we have a broad, blunt termination.

The *Mytilus umbilicatus* of Pennant can be nothing more than a distorted variety from some injury to the lower margin, nearly under the beaks, or from adhesion to some small convex body, causing great contraction at this part, as may be frequently noticed.

In young and entire shells the hinge-margin rises in a straight line to a considerable height, and then slopes downwards, suddenly forming a conspicuous angle; but in older shells the angle disappears in a great measure, and the whole superior outline is regularly curved. When young, the epidermis seems to be prolonged at the lines of growth into fringe-like shreds. Specimens thus clothed are generally allowed to be the *Mytilus barbatus* of Pennant. *M.*

Gibbsii is said to differ in having these shreds serrated or gashed along one edge. I cannot but strongly suspect, though I cannot demonstrate it, that this apparent extension of the epidermis is a parasitic vegetable; and that *M. Gibbsii* is not, in reality, a different shell, but has a different vegetable growing upon it.

Old shells are also encrusted with various species of *Madrepore*, *Corallina*, and *Flustra*.

In young shells there is usually a broad, waxen-yellow radiation from the beak along the front side of the elevated ridge; and this region, in fact, always has a lighter color than other parts of the shell.

Deshayes thinks it is now impossible to say what was the true *Mytilus modiolus* of Linnæus, and therefore approves the course of Lamarck in dropping the name altogether and assuming a new one. I cannot see any reason to doubt that the shell under consideration was the *M. modiolus* of Linnæus, while there is ground to question whether the shell which Lamarck had in view when he applied the name *Papuana*, the name now universally applied to our shell, was in reality identical with our species. I have seen several specimens of the East Indian shell, and, though very closely allied, it seems to differ in many particulars when the two shells are placed side by side. Dr. Lovèn has lately assured me that this is the true *M. modiolus*, and repeats my conjectures as to the distinctness of the real *M. Papuana*.

The animal is of a dark orange, or red-ochreous color, perhaps a little tinted with brown. It is not used for food with us, though there seems to be no reason why it should not be as palatable as most of the shell-fish that are eaten.

Modiola plicatula.

FIG. 81.

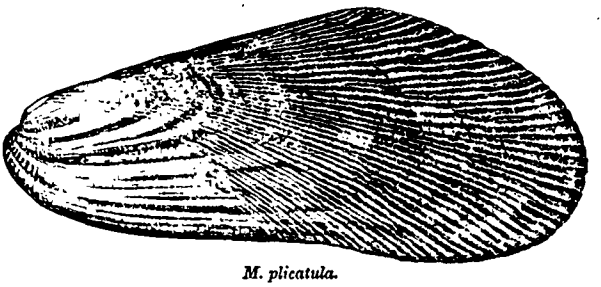
Shell oblong, falciform, widening posteriorly; surface traversed by numerous radiating ribs, occasionally branching; epidermis glossy, green and yellow.

Mytilus demissus, DILLWYN, Catal. i. 314. — WOOD, Index. pl. 12, fig. 30.
Modiola plicatula, LAM. An. sans Vert. vii. 22. — DE KAY, N. Y. Moll. 184, pl. 14, fig. 258. — GOULD, Inv. 1st ed. 125, fig. 81.
Mytilus plicatulus, DESHAYES, Encyc. Méth. Vers, iii. 568, pl. 220, fig. 5. — SOWERBY, Genera, fig. 7.
Modiola semi-costata, CONRAD, Journ. Acad. Nat. Sc. vii. 244, pl. 20, fig. 7.
LISTER, Conch. pl. 353, fig. 196.

Shell transversely oblong-ovate, much elongated, narrow before, and widening backwards, somewhat falciform or arched; beaks

moderately prominent, not curving outwards, and nearly in contact very near the anterior extremity, which is small and rounded, and the shell is much compressed at this part; the lower margin is generally curved or arched upwards, and gaping before the middle for the passage of the byssus; hinge-margin straight, and ascending for about two thirds the length of the shell, so as to give it additional height, then, by a regular downward curve, it produces an obliquely rounded termination to the shell; a broad, elevated ridge crosses obliquely from the beaks to this termination, above

Fig. 486.



M. plicatula.

which the shell is compressed; surface ornamented with numerous radiating, somewhat undulating, occasionally branching ribs, most conspicuous above and behind, very fine on the anterior third. Shell silvery-white, rather brittle, covered with a thin, varnished epidermis, variegated with yellow, green, and scorched colors, usually arranged in zones; stages of growth conspicuous; within silvery-white, the muscular impressions and margins of a livid color; margin of the posterior half and anterior side crenulated by the ribs. Length, three inches; height, one and three twentieths inches; breadth, nine tenths of an inch.

Inhabits the tide waters of small streams where there is some admixture of fresh water; and also the drains in salt marshes. In these localities they are found crowded in among the stones of the bed of the stream, or imbedded in the peat-like soil of the banks, near high-water mark. In this position, with the upper posterior portion slightly exposed, they crowd in such numbers as to form a complete stratum from six to twelve inches in thickness. A great portion of the time they are, of course, out of water; but they retain enough to serve the demands of their economy during the recess of the tide, and eject it when any disturbance prompts them to close their shell.

This species seems to be subject to little variety. Sometimes, however, we find the lower margin nearly straight. In this case the upper margin is nearly parallel to the lower, so that the shell increases but little in height; and in such shells the beaks appear much more prominent than in ordinary specimens.

The principal variations seem to consist in the coloring, which is made up of various shades, from bright yellow, passing through horn color and chestnut to dark bronze-green, and arranged in various modes and in various proportions. What Mr. Conrad regards as a distinct species, under the name *semi-costata*, certainly can be nothing more than a variety of this shell.

Genus MODIOLARIA, Gray. 1842.

Shell rhomboidal, sculptured by two rows (one on each side) of striæ, which radiate from the beaks, leaving the middle portion smooth; beaks incurved; hinge mostly toothless, but sometimes crenulated; hinge-plate finely notched.

Body sub-oval; mantle folded in front into a wide, incurrent tube, and behind into a conical, excurrent tube; foot strap-shaped.

Modiolaria nigra.

Fig. 86.

Shell ovate, ferruginous, beaks prominent, and placed considerably behind the anterior extremity; minutely reticulated with fine, corrugated, concentric, and radiating lines.

Mytilus discors (var.), Chemn. Conch. viii. 195, pl. 86, fig. 767. — Schröt. Einleit. iii. pl. 9, fig. 15. — O. Fabr. (var. *suecicus*), Danske Vidensk. 1788, 460.

Mytilus discrepans, Montagu, Test. Suppl. 65, pl. 26, fig. 4. — Wood, Ind. Test. pl. 12, fig. 38. — Leach, Zool. Misc. ii. 36; Append. Ross's Voy. 176. — Maton and Rackett, Lin. Trans. viii. 111, pl. 3, fig. 9. — Turton, Conch. Dict. 112; Br. Fauna, 164.

Modiola discrepans, Flem. Br. An. 413. — Brown, Ill. 78, pl. 27, fig. 8. — Sowerby, Gen. Shells (Mod.), fig. 3. — Reeve, Conch. Sys. pl. 100, fig. 3. — Phil. Zeitsch. 1844, 102.

Modiola nigra, Gray, Append. Parry's Voy. 244 (adult) (1824). — Thorpe, Mar. Conch. 249, fig 2 (jun.). — Hanley, Recent Shells, i. 242, pl. 12, fig. 38.

Modiola depressa, Hanley, Recent Shells, i. 242, note.

Modiola nexa, Gould, Inv. 1st ed. 128, fig. 86. — Mighels, Shells of Maine, Journ. Bost. Soc. iv. 327. — Reeve, Elem. Conch. ii. 73, fig. 173.

Crenella nigra, King, Ann. Nat. Hist. xviii. 239. — Forbes and Hanl. Br. Moll. ii. 202, pl. 44, fig. 5; pl. Q (animal). — Gray, Cat. Br. Mcll. pl. 7, 121.

Modiolaria nigra, Lovèn, Ind. Moll. Scand. 33. — Mörch, Prod. Moll. Grœnl. 21. — Middend. Malac. Ross. 17.
Mytilus pectinulus, Stimpson, Shells of New England, 11 (1851).
Modiolaria striatula, Beck, in Gaim. Voy. in Isl. pl. 17, figs. o–f.
Modiolaria discors, Middend. Malac. Ross. iii. 15, pl. 12, figs. 11, 12 (young).

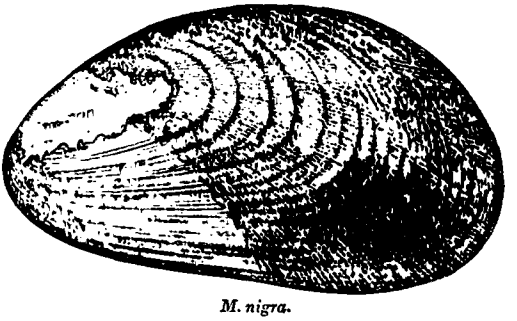
Shell small, thin, long-ovate, largest behind, slightly produced at the posterior extremity; basal edge less curved than the superior edge, which is moderately compressed; beaks prominent, pointed, directed forwards, scarcely touching each other, placed unusually far from the anterior extremity; a rather sharp ridge passes from the beaks diagonally across the shell, but loses itself about half-way across. Surface very beautifully sculptured with a network of very minute, crowded lines of growth, and very numerous, fine, indented radiating lines or ridges, which are obsolete along two thirds of the base, and most conspicuous behind, where a very fine line divides into two each ridge, going to the extreme posterior portion; while above these, on the compressed portion, a beautiful lace-work of hexagonal indentations is formed. The portion in front of the beaks is conspicuously radiated. Epidermis a rusty brown, with shades of olive, glossy; interior livid, with a pearly or silvery lustre, and with minute, radiating lines; cavity of the beaks large; margin simple. Length, seven tenths of an inch; height, nine twentieths of an inch; breadth five twentieths of an inch.

Fig. 487.

M. nexa.

This new and beautiful shell was taken by dredging in the harbor of Provincetown, by Colonel Totten, where he obtained several living specimens.

Fig. 488.



M. nigra.

It is allied to *M. discors* and *M. discrepans* by its outline, and by the triangular portion across the disk, nearly destitute of radiating lines. But it is more compressed than either of those shells, less inequilateral, and its sculpture far more beautiful. The radiating lines seem all to have indentations or punctures like the wing-covers of many large beetles (*Carabi*). The honeycomb arrangement near the hinge-margin is very beautiful. Dr. Lovén has sent me the shell, from Sweden, as the true *M.*

discrepans of Montagu and Turton; but in this he is at variance with the opinions and figures of all other authors.*

Modiolaria discors.

Fig. 83.

Shell sub-oval, broadest behind; beaks nearly terminal; hinder extremity somewhat lobed; surface divided into three compartments, of which the anterior is marked by about eight, and the posterior by numerous radiating lines; epidermis olivaceous.

Mytilus discrepans, Montagu, Test Brit. 169. — Dillwyn, Catal. i. 319. — Turton, Conch. Dict. 112; Brit. Faun. 164. — Fleming, Brit. Anim. 413.

Mytilus discors, Lin. Syst. Nat. 12th ed. 1159. — Lovèn, Ind. Moll. Scand. 33. — Maton and Rackett, Lin. Trans. viii. 111, pl. 3, fig. 9. — Hanley, Ipsa Lin. Conch. 46.

Modiola lævigata (var.), Gray, Appendix to Parry's 2d Voyage, 245.

Modiola discrepans, Lam. An. sans Vert. 2d ed. vii. 23. — Turton, Brit. Biv. 202. — Forbes, Mal. Monens. 44. — Thorpe, Br. Mar. Conch. 108. — Gould, Inv. 129, fig. 83. — Hanley, Recent Shells, i. 242. — Mighels, Shells of Maine, Journ. Bost. Soc. iv. 327. — De Kay, Nat. Hist. N. Y. 185.

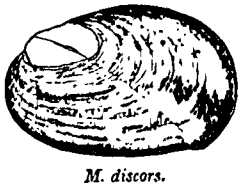
Modiolaria discors, Lovèn, Ind. Moll. Scand. 33.

Crenella discors, Forbes and Hanl. Br. Moll. ii. 195, pl. 45, figs. 5, 6; pl. 48, fig. 5. — Gray, Cat. Moll. 120. — Adams, Gen. ii. 514, pl. 121, fig. 3.

Mytilus discors, Stimpson, Inv. Gr. Manan, 21; Shells of New England, 12 (1851).

Shell somewhat oval, rather oblique, highest about the middle, rounded before, base slightly curved, hinge-margin straight and then curving obliquely downward; beaks near the anterior end prominent, and rounded; valves moderately convex; surface coarsely marked by the lines of growth, and divided into three fan-shaped compartments, of which the foremost one is marked by about eight small, rounded, rib-like ridges, the spaces between them being flat, the hinder one by numerous similar ridges, and the central one is plain, or with very minute radiating lines; the limits between the posterior and middle compartments are designated by an elevated ridge passing from the beaks, and here the basal margin of the posterior compartments projects abruptly beyond that of the middle one, so that the rounded point of the shell forms a projecting lobe. Epidermis olive-green,

Fig. 489.

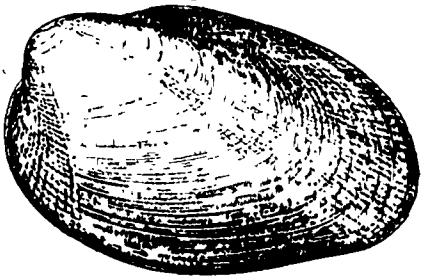


M. discors.

* Dr. Gould appears to have changed his opinion in regard to the identity of *Modiola nexa* with the European *M. nigra*, as in his MSS. he places the former in the synonymy of the latter. Fig. 487 represents the typical *nexa*, fig. 488 the *nigra* from north shore fisheries. — W. G. B.

with dark chestnut-colored shades, folding over the edge. Interior of a brilliant silvery lustre; edge of the two extreme compartments crenulated, and very strongly so near the ligament; a few folds on the edge, not corresponding to the external ridges, are found just in front of the ligament. Length, one inch; height, thirteen twentieths of an inch; breadth, four tenths of an inch.

Fig. 490.



M. discors (*M. lævigata*).

Found on Chelsea Beach, and in fishes' maws. Larger specimens are brought from the Newfoundland Banks. Halifax (*Willis*); Eastport (*Cooper*); fossil at Montreal (*Dawson*). I have two specimens which measure one and one half inches in length, and three fourths of an inch in breadth.

This species, with *M. corrugata*, is common to the northern coasts of Europe and America, and they are distinguished from all others by the three compartments into which their surface is divided. The distinctive marks between them are particularly pointed out under *M. corrugata*. The epidermis becomes nearly black by age.

Modiolaria corrugata.

Fig. 84.

Shell oval, tumid, upper edge somewhat compressed and arching, posterior tip somewhat produced and pointed; beaks large, nearly terminal; surface with about sixteen ribs at the anterior third, and very numerous ones at the posterior third.

Modiola discors, Gould, Inv. Mass. 130, fig. 84, not of English authors.
Mytilus corrugatus, Stimpson, Shells of New England, 12.

Shell irregularly oval, tumid, heart-shaped when viewed in front, bluntly rounded before; hinge-margin somewhat ascending and a little compressed; at the termination of the ligament the margin gradually curves downwards, so that the shell is terminated behind by a lobular, somewhat pointed tip on a level with the base; basal margin an undulating curve, nearly parallel with the upper margin; beaks large and prominent, not in contact, overhanging the anterior extremity; surface as in *M. discors;* but there are sixteen or more ribs in the

Fig. 491.

M. corrugata.

anterior compartment: those in the posterior compartment are more crowded, more distinct, the intervening spaces rounded; and when viewed under the microscope, the whole surface is found to be covered with minute wrinkles of the epidermis crossing the ribs and the spaces between them, and also the middle compartment; epidermis greenish-yellow with clouds of olive. Within silvery, margin crenulated by the ribs, and with three or four teeth before the beaks.

Eastport to Cape Cod (*Stimpson*); Greenland (*Möller*); Sambro Bend and Sable Island (*Willis*).

Genus CRENELLA, Brown. 1827.

Shell oval or rhomboidal, cancellated by longitudinal ribs and transverse plates; beaks straight; ligament small; hinge of each valve furnished with an upright tooth, which is crenulated as well as the hinge-plate.

Body roundish-oval; mantle open in front, and folded behind into a sessile excurrent tube; foot worm-shaped, the point being disk-like and issuing out of a sheath.

Crenella glandula.

Fig. 87.

Shell obliquely rounded-oval, regularly convex; beaks small, separate; surface with minute lines of growth, crossed by minute and crowded radiating lines; epidermis brownish-yellow; margin crenulated.

Modiola glandula, Totten, Silliman's Journ. xxvi. 367, figs. 3, *e*, *f*, *g*. — Gould, Inv. 131, fig. 87.
Mytilus decussatus, Stimpson, Shells of New England, 11.
Crenella decussata, Forbes and Hanl. — De Kay, N. Y. Moll. 186, pl. 22, fig. 248.
Crenella glandula, Stimpson, Smith. Inst. Check Lists (1860), 2.

Shell small, thin, rounded-oval, rather inflated, convexity regular; beaks small, rather prominent, curving, not in contact, placed at about half the height of the shell; anterior portion slightly depending, base nearly straight, and the rest of the margin regularly rounded; surface with minute lines of growth, crossed by very small, rounded, radiating ribs, about equal in size on all parts of the shell, the number increasing as the spaces between them widen; epidermis thin, brownish-yellow; within white, somewhat pearly; edges sharp and minutely crenulated, except the short portion occu-

Fig. 492.

C. glandula.

pied by the ligament. Length, five twentieths of an inch; height, nine twentieths of an inch; breadth, three tenths of an inch.

This very pretty and singularly shaped *Crenella* was first found by Colonel Totten, in Provincetown Harbor. It is one of the most common shells found in the stomachs of fishes caught in Massachusetts Bay. The shell is not often so large as above mentioned.

Marblehead, seven fathoms mud (*Haskell*); Halifax (*Willis*); Eastport (*Cooper*); Stonington (*Linsley*); Montreal, fossil (*Dawson*).

Its rounded-oval and regularly convex form, with its radiating lines, forbid that it should be confounded with any other shell except an English species, the *Crenella elliptica* of Brown (*Conch. Illust. of Great Brit., &c.* pl. 31, f. 12 to 14), the *Mytilus decussatus* of Montagu. For my own part, in comparing a small specimen of this shell with one of ours of a similar size, I must confess I can discover no difference, though Mr. Sowerby supposes they are distinct. In giving the dimensions, I have supposed the shell to be placed in the ordinary position of other species, with the beaks placed laterally.

Crenella pectinula.

FIG. 85.

Shell obovate, ventricose, with about forty equal, radiating ribs; beaks prominent, projecting as far as the anterior margin; epidermis brownish yellow.

Modiola pectinula, GOULD, Inv. Mass. 127, fig. 85. — MIGHELS, Catal. in Bost. Journ. iv. 326. — DE KAY, Nat. Hist. New York, 185.
Mytilus pectinulus, STIMPSON, Shells of New England, 11 (1851).
Crenella pectinula, STIMPSON, Smith. Inst. Check Lists (1860), 2.

Shell small, strong, of a strictly ovate form, excepting that a very short portion of the hinge-margin is straight; broadly rounded at both extremities, but most so behind; valves convex, without any marked ridge passing from the beaks, and very little compression at the hinge-margin; beaks rather prominent, blunt, and in contact with each other, reaching forward as far as the anterior extremity; surface covered with about forty equal, rounded, radiating ribs; epidermis a dark gamboge-yellow; lines of growth minute; within pearly, of a livid or leaden color; entire margin crenulated by the ribs; cavity of the beaks considerable. Length, seven tenths of an inch; height, one half inch; breadth, seven twentieths of an inch; another specimen, nineteen twentieths by thirteen twentieths of an inch.

Fig. 493.

C. pectinula.

Inhabits St. George's Bank. Gulf St. Lawrence (*Mighels*); Northwest coast of Greenland (*Hayes*).

This very strongly-marked species seems to have been hitherto undescribed. It is closely allied to *Modiolaria discors*, but is smaller, stronger, lighter colored, and entirely covered with ribs. Of five or six specimens which I have seen, all apparently mature shells, the largest was of the size given above. *Modiola arctica*, Leach, is a smaller and more rounded shell, and the ribs are much more numerous.

Family PECTENIDÆ, Lamarck.

Ligament interior or half interior. Shell in general regular, compact, not foliated.

Genus PECTEN, Brug. 1789.

Shell rounded, inequivalve, eared; superior margin straight; beaks contiguous. Hinge toothless, with a triangular internal pit for the cartilage.

Pecten tenuicostatus.

Shell orbicular, inequivalve, upper valve more convex than the lower; exterior surface everywhere marked with closely-arranged, radiating lines; interior surface without ribs; ears small and equal.

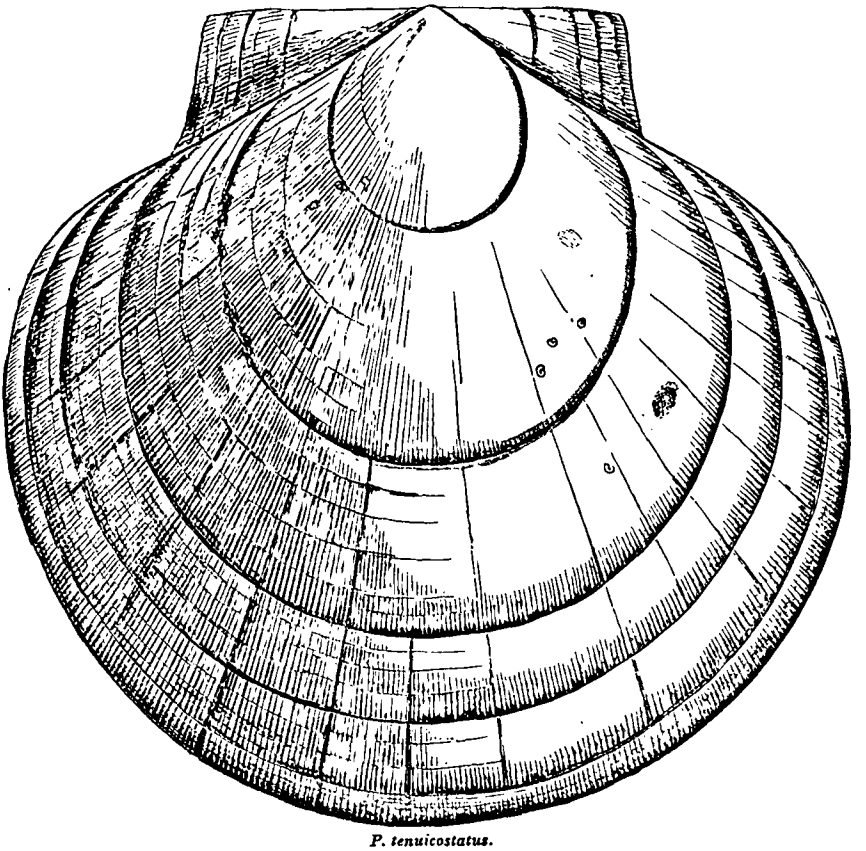
Pecten Magellanicus, Conrad, Amer. Mar. Conch. pl. 1, fig. 1. — Gould, Inv. 132. — De Kay, N. Y. Moll. 173, pl. 11, fig. 207. — Stimpson, Shells of New England, 8.
Pecten tenuicostatus, Mighels and Adams, Bost. Journ. Nat. Hist. iv. 41, pl. 4, fig. 7; Pr. i. 49 (1841). — Stimpson, Smith. Inst. Check Lists (1860), 2.

Shell orbicular, rather higher than long, thin and translucent when young, thick, strong, and opaque when mature, equilateral, inequivalve, the lower valve being nearly flat, and not attaining the edge of the upper valve by an eighth of an inch or more; upper valve moderately convex; valves widely gaping near the hinge, surface everywhere sculptured with radiating, punctured lines, or grooves, about half as wide as the spaces between them, somewhat zigzag in their course; these lines are crossed by closely-arranged lines of growth, which, on the convex valve, are scalloped or vaulted over the radiating lines; flattened valve white, convex valve dingy reddish-brown or flesh-colored. Hinge-margin narrow, straight, ears equal, the notch in the lower valve rounded and shallow. Interior

white, smooth, glossy, with minute radiating lines not corresponding to the exterior grooves. Length, five inches; height, five and one half inches; breadth, one and one half inches.

This shell is not common on the Massachusetts shore; but single valves, of a very large size and very solid, are occasionally thrown

Fig. 494.



P. tenuicostatus.

up, and smaller ones are found in the stomachs of fishes. Its proper habitat is farther north, and along the eastern part of the coast of Maine it is found abundantly in its greatest perfection. It does occasionally pass to the south of Cape Cod (the usual terminus for northern species), for I have a fine specimen which was drawn up alive by a hook, off Block Island. Eastport (*Cooper*); Nahant Beach, alive (*Haskell*); Sable Island (*Willis*).

The general aspect of the lower valve is smooth; nor do we see anything like ribs on the upper surface.

Pecten Islandicus.

Fig. 87.

Shell sub-orbicular, reddish or orange-brown; ears unequal; surface covered with small, crowded, irregularly disposed, scaly, radiating ribs, which reappear within.

Ostrea Islandica, Müller, Zool. Dan. Prod. No. 2990. — Lin. Iter Westrogoth. 200, t. 5, fig. 7. — Gmélin, 3326, No. 55. — Shaw, Zool. Misc. xxiii. t. 978, 987. — Wood, Ind. pl. 7, fig. 21. — Fabr. Fauna Grœnl. 415. — Knorr, Délices, &c. t. 1, pl. B, figs. 3, 4. — Lister, Conch. t. 1057, fig. 4. — Gualt. Test. t. 73, fig. R. — Seba, Mus. ii. t. 87, fig. 7.

Pecten Islandicus, Chemn. Conch. vii. 314, t. 65, figs. 615, 616. — Turton, Conch. Dict. 258; Brit. Biv. 216. — Desh. Encyc. Méth Vers, iii. 724, pl. 212, fig. 1. — Flem. Brit. Anim. 385, pl. 212, fig. 1. — Lam. An. sans Vert. vii. 145. — Say, Amer. Conch. i. pl. 56. — De Kay, N. Y. Moll. 173, pl. 11, fig. 206. — Gould, Inv. 1st ed. 133, fig. 87.

Ostrea cinnabarina, Born, Mus. 103. — Dillwyn, Catal. 256, No. 20. — Schroet. Einl. iii. 326, No. 9.

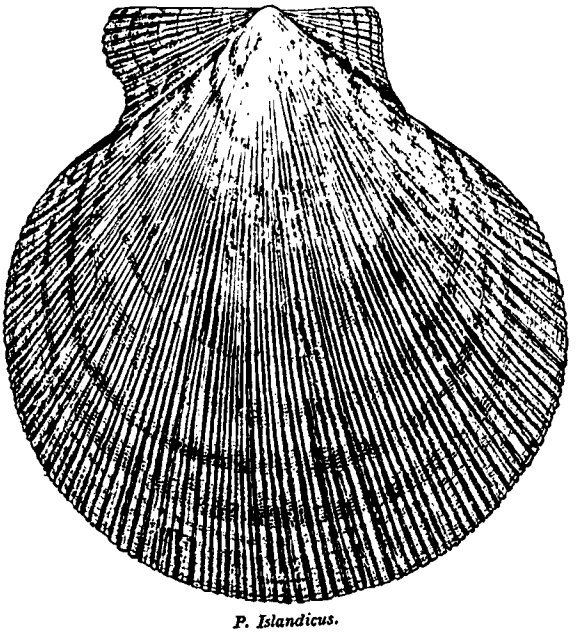
Pecten Pealii, Conrad, Amer. Mar. Conch. 12, pl. 2, fig. 2.

Pecten rubidus, Martyn, Un. Conch. No. 153, pl. 53, fig. 1 (1784).

Chlamys Islandicus, Chenu, Man. ii. 184, fig. 928.

Shell sub-orbicular, or broadly obovate, equal, the upper valve

Fig. 495.



P. Islandicus.

slightly more convex than the lower, covered with an indefinite number, fifty to a hundred, of narrow, unequal, crowded, irregularly

disposed, radiating ridges, bearing a multitude of erect, vaulted scales; their ridges are grouped so as to form a number of unequal ribs, which are better defined on the interior of the shell. Ears unequal; posterior one shorter, and its angle slightly obtuse, alike in both valves, and covered with scaly, radiating ridges; the anterior ear of the right valve is more deeply notched than that of the left, and has five radiating ribs, occupying about two thirds of its surface. Valves closed except at the notch; color passing from light orange to dark reddish-brown; the upper valves usually zoned, or blotched, with deeper colors, and the lower valve much the lightest. The margin jagged by the elevated lines, all but the notch of the right valve, which is plain, excepting that there are five or six minute teeth in the angle. Interior white and glossy, the left valve usually having a large roseate spot near the beaks. Length, three inches; height, three and one half inches; breadth, one inch.

Occasionally found, of a small size, in the stomachs of fishes. Its proper residence, however, seems to be the Newfoundland Banks, where it is a favorite food of fishes. Eastport (*Cooper*); Halifax (*Willis*); W. C. of Greenland (*Hayes*); Cape Hope, James's Bay, lat. 52° 10′, fossil (*Drexler*); Eastport to Connecticut (*Stimpson*).

In a young state the vaulted scales do not appear; but the interstices between the ribs are filled with a beautiful lozenge-shaped or tile-work sculpture, which may usually be seen near the beaks in adult specimens. The coloring varies greatly, and has given rise to two or three synonymes.

Pecten irradians.

FIG. 88.

Shell orbicular, ears sub-equal, valves convex, nearly closed, with about twenty rounded ribs.

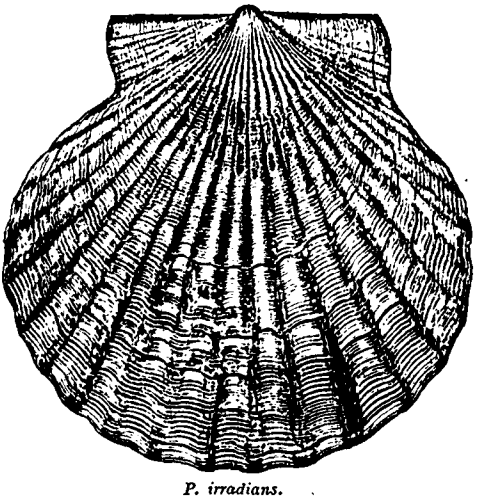
Pecten irradians, LAM. An. sans Vert. 2d ed. vii. 143. — STIMPSON, Shells of New England, 8.

Pecten concentricus, SAY, Journ. Acad. Nat. Sc. ii. 259 (1822). — CONRAD, Amer. Mar. Conch. pl. 1, fig. 2. — DE KAY, N. Y. Moll. 172, pl. 9, fig. 205. — GOULD, Invert. 1st ed. 134, fig. 88.

Shell nearly round, rather strong; valves convex, the lower very little less so than the upper one, with about twenty elevated, rounded ribs, the depressed spaces being similarly rounded, and about equal to the ribs in width; loosely wrinkled concentrically by fine lines of growth. Usual color a dusky or blackish horn color, with alternately darker and lighter zones. Ears two thirds of the length of the

shell, nearly equal, and crossed with small, radiating ridges; notch in the convex valve deep, and forming an acute angle, or narrow slit. Interior shining, grooved to correspond with the exterior ribs, the intervening spaces flat; color white, generally tinged with purple-brown about the hinge and around the margin, sometimes altogether of that color. Ligamentary pit small and shallow. Length, two and three fifths inches; height, two and one half inches; breadth, one inch.

Fig. 496.



P. irradians.

The *scallop-shell* is found abundantly about the extremity of Cape Cod, though it does not extend far along its inner shore. It is common along all its outer shore, at Nantucket, Martha's Vineyard, &c., and, according to Mr. Say, is one of the most common shells along the shores of New Jersey. Cape Ann, southward (*Stimpson*); Texas (*Roemer*); Sable Island (*Willis*).

It is subject to great variation in coloring. The flatter valve is often white, and always of a lighter color than the other valve. Sometimes both valves are white, orange, ochreous, reddish, or purplish, and sometimes they are zoned or mottled with two or more of these colors. In consequence of which they are very pleasing to the eye, and are extensively employed in the manufacture of card-racks, pincushions, &c.

Pecten fuscus.*

Pecten fuscus, LINSLEY, Shells of Conn. in Sillim. Journ. 1st series, xlviii. 278 (1845), no descr. — GOULD, in same, new series, vi. 235, fig. 6 (1848). — STIMPSON, Shells of New England, 8, in Errata under the name of *P. brunneus* (1851); in Smith. Inst. Check Lists, 2 (1860).

Shell small, thin, somewhat elongated, slightly convex, with about twenty-four thread-like radiating ribs; the whole surface, viewed

* This species was represented in Dr. Gould's MSS. by a blank sheet only. I may mention here that *Lima sulculus*, Leach, has been found at Sable Island (*Willis*). — W. G. B.

with a magnifier, is found to be sculptured with microscopic lines, which curve from the centre towards the sides without reference to the ribs, the posterior one slightly emarginate. Color, a dusky red.

I have seen only one valve, which differs from any shell hitherto described, but the characters of the entire shell are of course incomplete. Length, nine thirty-seconds of an inch; breadth, seven thirty-seconds of an inch. (*Gould* in Sillim. Journal.)

Family OSTREIDÆ.

Shell irregular, foliated, sometimes paper-like; ligament internal or partly internal.

Genus OSTREA, Lin. 1758.

Shell very irregular, inequivalve, the larger one adhering, the smaller moving forwards as the shell advances in age, and leaving a lengthening groove for the ligament exposed along the beak of the adhering valve.

The *Oyster* varies in surface and shape so much, according to the position in which it lies during growth, that it is not only impossible to give any description which shall delineate the various transformations it may undergo, but it is also very difficult to designate the limits of species. Lamarck indicates three species belonging to this coast; but it is very doubtful whether, in reality, there are even two.

It is also a question on which there are various opinions, whether the oyster was indigenous in Massachusetts Bay; or whether all which grow in the various oyster-beds owe their parentage to inhabitants of the Delaware, Chesapeake, and Oyster Bays, &c. That they now grow spontaneously, and, for aught we can learn, always have grown so, on the south shore, there is no reason to doubt. And that they are occasionally found of patriarchal appearance, in all parts of our bay, is certainly true. But the question is, whether these places are their natural habitat, or whether they have been accidentally dropped where they were found. Many incline to this latter opinion, especially the younger oystermen, and some scientific gentlemen. But the old settlers of Cape Cod are of a different opinion. They say that Wellfleet, where the Southern oysters are *planted* for Boston use, was originally called Billingsgate, on account

of the abundance of fish, and especially of oysters, found there; that they continued to be abundant until about the year 1780, when from some cause they all died; and, to this day, immense beds are shown there of shells of native oysters which perished at that time. They say that, before that time, no such thing was thought of as bringing oysters from the South.

Ostrea Virginiana.*

Shell elongated, narrow; beaks pointed, not much curved; ligamentary eminence of the upper valve extending back to the apex.

Ostrea Virginiana, LISTER, Conch. t. 200, fig. 34. — FAVANNE, Conch. pl. 41, fig. C, 2. — KLEIN, Tentam. 122. — SOWERBY, Genera of Shells, fig. 2. — GOULD, Inv. 1st ed. 136.
Ostrea Virginica, GMÉLIN, Syst. 3336, No. 113. — DILLWYN, Catal. i. 277. — LAM. An. sans Vert. vii. 225. — WOOD, Index, pl. 11, fig. 68. — DESHAYES, Encyc. Méth. Vers, iii. 296, pl. 179, 1 and 2.
Grand Huitre de la Virginie, DAVILA, Catal. 290, No. 613.
Virginia Rock-oyster, PETIVER, Gazophyl. t. 105, fig. 3.
Ostrea rostrata maxima, CHEMN. Conch. viii. 38, t. 73, fig. 677.
Ostrea elongata, SOLANDER, MSS.
Ostrea Canadensis, LAM. An. sans Vert. vii. 226.

Shell narrow, elongated, gradually widening, moderately curved, for the most part with a long and pointed beak at the apex, and rounded at the other extremity. Upper valve the smaller, flatter, and smoother; surface, when not worn, presenting everywhere leaf-like scales, of a somewhat leaden-color. The hinge presents the usual channel in the beak of the lower valve, longer or shorter according to the age of the shell, and marked with lines exhibiting the successive removes of the cartilage; and in the upper valve we have the corresponding elevation, which is also continued back to the point of the shell. The muscular impression is nearly central, of a dark chestnut, or sometimes dark violet color. It often measures twelve or fifteen inches in length, but seldom more than three inches in breadth.

This is the common oyster of the Chesapeake Bay. It is occasionally found in the vicinity of Boston, and also about Prince Edward's Island, at the mouth of the St. Lawrence. Tatamagouche, &c. (*Willis*). Its distinctive characters are its narrow, elongated form, and the lengthened, pyramidal hinge ridge, along the beak of the upper valve. The *O. Canadensis* is either a variety of this, or the next species, most likely of this.

* It would be impossible to figure all the forms of this and the following variable shells. Had Dr. Gould lived to finish his work, I believe he would have referred all the New England oysters to one species. — W. G. B.

Ostrea borealis.

Shell somewhat rounded, curved, scaly, greenish; beaks rather short, considerably curved; hinge having the furrow in the lower valve from the apex, but having in the opposite valve merely a transverse ridge, not extended backwards.

Ostrea borealis, Lam. An. sans Vert. vii. 220. — Gould, Invert. 1st ed. 137. — De Kay, N. Y. Moll. 169, pl. 10, fig. 203, 204. — Stimpson, Shells of New England, 8.
Ostrea Canadensis, Brug. Encyc. Méth. pl. 180, figs. 1–3. — Lam. An. sans Vert. vii. 226.
Ostrea edulis, Lin., &c.

Shell somewhat obliquely rounded ovate, usually curved, upper valve smaller, flatter; the beaks are never greatly prolonged, more curved than in *O. Virginiana*. The surface is very irregular, displaying loosely arranged flakes of a greenish-color; the margins are generally more or less plaited or scalloped, entirely bony in the lower valve, but membranous and somewhat flexible in the upper one. The hinge differs from the preceding in having the beaks less prolonged, and the upper valve, instead of having a lengthened, pyramidal ridge extending backwards to the apex, has only a transverse ridge, abrupt behind, and sloping into the shell, like a mere partition, behind which the cartilage is attached. The muscular impression is also dark violet. Interior, either chalky or greenish-white.

This species also grows to a great size. A specimen before me measures a foot in length, and six inches in breadth. A common size is five and six inches in length.

This is the common New York oyster, and, although they are said to have been once abundant in various parts of Massachusetts Bay, especially within Cape Cod, yet the Boston market is now chiefly dependent for its supply on the oyster-beds in the vicinity of New York, and in the Chesapeake. In those parts of Buzzard's Bay which border upon Sandwich the native oyster is still found in great abundance.

The oystermen maintain that our shell is identical with the English *O. edulis;* and there are certainly forms in which the American and European specimens could not be distinguished.

Genus ANOMIA, Lam 1767.

Shell irregular, inequivalve, one valve convex, the other flattened or concave, perforated near the beak for the passage of a muscle, by which it adheres.

Anomia ephippium.

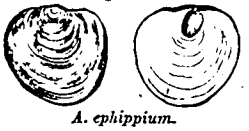
Shell rounded, margin irregular; surface scaly, variously wrinkled and undulated; beaks pointed, not quite reaching the margin; aperture ovate.

Ostreum parvum, Lister, Conch. t. 204, fig. 28.

Anomia ephippium, Lin. Syst. Nat. 1150. — Gmélin, Syst. 3340, No. 3. — Gualt. Test. t. 97, fig. B. — D'Argenv. Conch. t. 19, fig. C. — Pennant, Brit. Zool. iv. t. 62, fig. 70. — Chemn. Conch. viii. t. 76, figs. 692, 693. — Montagu, Test. Brit. 155. — Wood, Lin. Trans. vi. pl. 18, figs. 11, 12; Ind. pl. 11, fig. 3. — Maton and Rackett, Lin. Trans. viii. 102. — Donovan, Brit. Sh. t. 1, pl. 26. — Born, Mus. fig. 117. — Schroet. Einl. iii. 383. — Poli, Test. ii. 186, pl. 30, figs. 9, 11. — Da Costa, Brit. Conch. 165, pl. 11, fig. 3. — Favanne, Conch. pl. 41, fig. B. — Dillwyn, Cat. i. 286, No. 3. — Blainv. Mal. pl. 59, fig. 3. — Sowerby, Gen. figs. 1, 2, 3. — Turton, Brit. Biv. 227; Conch. Dict. 2. — Lam. An. sans Vert. vii. 273; Encyc. Méth. pl. 170, figs. 6, 7. — Gould, Invert. 1st ed. 138. — De Kay, N. Y. Moll. 186, pl. 12, fig. 209. — Flem. Brit. An. 395.

Shell generally rounded, but often produced at one side or at base, so as to assume an oval form; its margins more or less jagged, and its surface scaly from the loose edges of the lines of growth, and variously distorted, undulated, and plaited, according to the objects to which it adheres. Lower valve flat, its aperture ovate, reaching the margin by a fissure. Upper valve slightly convex, little elevated about the beak, which is small, acute, not quite reaching the margin. Substance of the shell pearly, or like talc, of a greenish tinge, reflecting golden and silvery hues; within smooth, the muscular impressions opaque white. Usually about an inch in diameter, but growing to three times that size.

Fig. 497.



A. ephippium.

It is found in abundance in oyster-beds, adhering to oysters. At New Bedford it has been found anchored by its muscle to pebbles. Eastport (*Cooper*); wreck of a frigate, Herring Cove (*Willis*).

This shell varies so much in its form that it is very difficult to characterize it. The most constant trait is the rugged, scaly exterior. It not unfrequently assumes a ribbed appearance, in consequence of having adhered to valves of *Pecten irradians*.

Anomia aculeata.

Fig. 90.

Shell rounded, inclined to be straight at the hinge-margin; color dingy white; beaks obtuse, terminal; upper valve covered with fine, prickly, radiating lines; lower valve smooth; aperture circular.

Anomia aculeata, GMÉLIN, Syst. 3346. — TURTON, Lin. Syst. iv. 285; Brit. Biv. 233; Conch. Dict. 4. — CHEMN. Conch. viii. 92, t. 77, fig. 702. — MONTAGU, Test. Brit. 157, t. 4, fig. 5. — PENNANT, Brit. Zool. iv. 233. — DILLWYN, Catal. 288. — MATON and RACKETT, Lin. Trans. viii. 103. — WOOD, Index, pl. 11, fig. 7. — GOULD, Inv. 1st ed. 139, fig. 90.

Shell small, rounded, the hinge-margin more or less truncated or straight, color yellowish-white; upper valve convex, the beak obtuse and marginal, the surface covered with minute, concave, or prickly scales, arranged in radiating, undulated lines; lower valve very thin, smooth, or with a few prickles near the margin; aperture nearly circular; within shining; the convex valve exhibiting the exterior ribs near the margin. Diameter about half an inch.

Fig. 498.

A. aculeata.

Found amid the roots of Fuci which are thrown up attached to stones, shells, &c. Eastport (*Cooper*); Halifax (*Willis*).

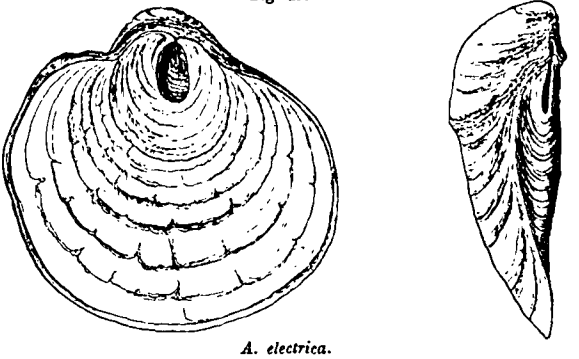
This shell is easily distinguished from its co-species by the scaly or prickly radiating lines upon its upper valve. It seems never to attain a large size.

Besides the two species before mentioned, there are probably two others found in this State. But all species are so distorted as to render it difficult to separate them definitely.

Anomia electrica.* LIN.

Distinguished by its sulphur or golden hue, defined edge, and

Fig. 499.



A. electrica.

* I am indebted to Mr. Samuel Powel, of Newport, R. I., for the specimen figured, which was found with numerous others, living, at Stone Bridge, by T. N. Dale, Jr. The species is very common at Newport. I suppose it to be the *electrica*. The figures are the natural size. — W. G. B.

very convex upper valve. It is generally much distorted, trans parent, and not so fragile as most species, not scaly.

Found among oysters.

See remarks under the following species.

Anomia squamula, Lin.

A small, smooth, rounded, or oblong-oval shell, very thin and regular, exhibiting regular concentric lines of growth; color whitish; edges well defined; aperture rounded.

Found attached within old bivalve shells.

This and the last species, however, are not positively made out.

Class BRACHIOPODA.*

ANIMAL furnished with a pair of cirrated arms or oral appendages, which are free or united by membrane, sometimes supported by calcareous processes. Mantle-lobes closely applied to the valves, fringed with horny *setæ*, and supplied with branching veins, gills none, respiration performed by the vessels of the mantle. Foot none.

Shell inequivalve, attached to submarine bodies by a muscular peduncle, or by the substance of its ventral valve; valves dorsal and ventral, united by muscles, and usually articulated by teeth. Marine.

The class takes its name from the long fringed organs which are attached near the mouth, and are regarded as designed to bring food to the mouth. The valves are generally considered as upper and lower, instead of right and left, as in other bivalves, the larger one, which often has a long curved beak out of which the pedicle issues, being the lower one. By others, however, they are considered as anterior and posterior. There are but few species living at the present day, but they are found in a fossil state in great abundance throughout the rocks of many geological periods.

FAMILY TEREBRATULIDÆ.

SHELL round or oval, lower valve with a prominent beak and two curved hinge teeth; upper valve with a hinge process, and a shelly loop to which the arms are attached.

Genus TEREBRATULINA, D'ORB. 1847.

SHELL punctured, oval, with a faint central depression and radiating ribs; beak large with a large aperture bounded in part by the end of the upper valve; hinge of one oblique tooth in the upper

* All relating to the Brachiopods was prepared for the press by Dr. Gould. — W. G B.

valve fitting between two in the lower, which has also slight earlike prolongations; a stem arises from each side of the hinge, uniting with its opposite, and bearing a short, nearly circular loop for the support of the arms.

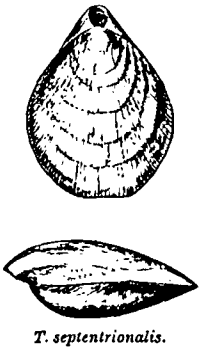
Terebratulina septentrionalis.

Shell obovate, whitish, upper valve truncated horizontally at the apex; foramen large, one side completed by the apex of the lower valve; surface with minute, radiating striæ.

Terebratula septentrionalis, COUTHOUY, Bost. Journ. Nat. Hist. ii. 65, pl. 3, fig. 18.— STIMPSON, Mar. Invert. Gr. Manan, 20; Shells of New England, 7.
Terebratula caput-serpentis, GOULD, Inv. Mass. 1st ed. 141.

Shell rather thin, semi-transparent, yellowish or reddish-white, broadly obovate; upper valve slightly convex, narrow at the summit, and abruptly widening below; beak slightly projecting, truncated horizontally so as to form a large, semi-elliptical orifice, completed below by the apex of the lower valve, which valve is rounded, flattish, slightly protuberant down the middle; both valves covered by minute, but distinct and well-rounded radiating ribs, which increase in number with the width of the shell; these are crossed by a few irregular lines of growth; the whole covered by a thin, silvery, fibrous epidermis. From under each tooth in the lower valve arises a thin process curving a little inwards, whose extremities support an oval, partially twisted ring of a similar ribband-like structure, about an eighth of an inch in diameter. Margin of the shell minutely toothed by the terminations of the ribs. Length, eleven twentieths of an inch; height, twelve twentieths of an inch; breadth, five twentieths of an inch.

Fig. 500.



T. septentrionalis.

Found in considerable numbers in the stomachs of fish, and occasionally on the sea-beach. It has also been taken alive on the coast of Maine. Its usual residence is in more northern seas.

Laminarian to deep sea coral. Eastport at low water, common; off Isle of Shoals, twenty fathoms to Cape Cod; Grand Manan, common (*Packard, Stimpson*); Halifax Harbor, common (*Willis*).

An examination of the descriptions of *T. caput-serpentis*, given

by Linnæus, Müller, and Chemnitz, and a comparison of them with our shell had well satisfied me of their correspondence. The downy epidermis is a character too rare and singular to be overlooked. This, however, is rubbed off very easily. The shell is much thinner, in general more elongated, and the striæ nearly twice as numerous, being about thirty to forty in the European, and fifty to sixty in the American specimens. No account of the internal bony processes is given in any description except that by Mr. Couthouy. These would afford the best possible specific character, were it not that they are usually more or less broken. But I have been relieved from all further speculation by the receipt of specimens from Dr. Lovèn, which settle the identity of our species with the European *caput-serpentis*. Deshayes conjectures, probably with justice, that the *Anomia aurita* of Gmelin is the same thing; and also, that *Anomia pubescens* of the same author and others is this shell in a young stage, when plentifully coated with pubescence. *T. costata*, described and figured by Lowe, in the "Zoological Journal," ii. 105, pl. 5, figs. 8, 9, is very closely allied; but it is a smaller, more solid shell, with fewer ribs, and entirely different internal processes.

[I have retained the above remarks from the former edition, because our shell is so generally still regarded as identical with the European species. But further examination of numerous specimens has led me to coincide with Dr. Stimpson, who has dredged extensively, both in the British and American seas, in his opinion that "the species differs from the European *caput-serpentis* sufficiently in both shell and animal."

Family RHYNCHONELLIDÆ, D'Orbigny.

Shell with radiating ribs, the arm supports long, slender, simple, and gently curving towards each other; no area; the opening for the pedicle usually completed by two small pieces; animal with elongated spiral arms.

Genus RHYNCHONELLA, Fischer. 1809.

Shell triangular, acutely beaked; usually plaited; large valve elevated in front, depressed at the sides; small valve flattened or hollowed along the centre hinge-plate with two slender curved processes.

Rhynchonella psittacea.

FIG. 91.

Shell sub-triangular, contracted above, the beak produced into a decurved horn; surface striated, foramen triangular.

Anomia rostrum psittaci, CHEMN. Conch. viii. 106, t. 78, fig. 713.
Anomia psittacea, GMÉLIN, Syst. 3348, No. 41. — DILLWYN, Catal. i. 296. — WOOD, Index, pl. 11, fig. 27. — TURT. Conch. Dict. 5, fig. 42–44.
Terebratula psittacea, DESHAYES, Encyc. Méth. Vers. iii. 102, pl. 244, figs. 3, *a*, *b*, *c*. — LAM. An. sans Vert. 2d ed. vii. 333.— TURTON, Brit. Biv. 236. — FLEMING, Brit. An. 368. — THOMPSON, Ann. Nat. Hist. xiii. 433; Brit. Mar. Conch. 127. — BROWN, Ill. Conch. Gr. Brit. 68, pl. 46, figs. 2–4. — CROUCH, Introd. Lam. Conch. pl. 13, fig. 4. — SOWERBY, Genera, fig. 5; Thesaur. i. 342, pl. 71, figs. 78–80. — SOWERBY (Junior), Conch. Man. fig. 202. — GOULD, Inv. of Mass. 141, fig. 91. — REEVE, Conch. Syst. pl. 126, fig. 5. — MIDDENDORFF, Malac. Ross. part 3, p. 1, t. 11, figs. 11–17.
Hypothyris psittacea, KING, Ann. Nat. Hist. xviii. 238 (1846). — FORBES and HANLEY, Brit. Moll. ii. 346, pl. 67, figs. 1–3 — STIMPSON, Shells of New England, 7.
Rhynchonella psittacea, OWEN, Trans. Zool. Soc. i. 145, pl. 22, figs. 12–14 (animal). — ADAMS, Genera, ii. 582, pl. 132, figs. 2, 2*a*, 2*b*. — CHENU, Man. de Conch. ii. 219, figs. 1126–1128.

Shell thin and fragile, brownish-black or sea-green, of an inflated, triangular form, one of the valves produced into a long, pointed, and strongly curved beak, something like a parrot's beak; along this runs a triangular channel, formed by the inflected margins, the third side of which is completed by the tip of the other valve; the smaller valve is obovate or fan-shaped, about two thirds the length of the longer valve; surface marked with concentric lines of growth, and with numerous, fine, diverging striæ, increasing in number as the shell widens. The interior bony processes consist of two slender, curved, parallel prongs, arising from the base of the teeth of the upper valve. Height, one half inch; length, seven twentieths of an inch; breadth, one fifth of an inch.

Fig. 501.

R. psittacea.

I have as yet met with only one specimen of this shell of the above dimensions, which was taken from the stomach of a codfish. It appears to be everywhere rare, and is probably an inhabitant of more northern seas, especially the region of Newfoundland.

[Deep sea Coral Zone, Northern Coast (*Stimpson*); Banks of St. Margaret's Bay (*Willis*); Drontheim to North Cape (dredged in forty to one hundred and fifty fathoms) (*McAndrew*); Russian

Lapland and Sitka (*Middendorff*). It has been found fossil at Beauport (*Dawson*); and at Cape Hope, James's Bay, 52° 10′ N. (*Drexler Coll.*). Hence, though nowhere abundant, this species seems to be circumpolar. The young specimens are fragile and sea-green; but the old ones become solid, globose, and tar-colored.

Genus WALDHEIMIA, King.

Shell smooth. The genus *Waldheimia* has the internal appendage composed of two free slender branches arising from the hinge, which advance about two thirds the distance across the shell, then curve upwards and backwards, then inwards, and unite at the centre.

Waldheimia cranium.

Surface smooth, whitish, minutely punctured.

Anomia cranium, Gmél. Syst. Nat. 3347. — Turton, Conch. Dict. 5.
Terebratula cranium, Müller, Zool. Dan. Prodr. 249, No. 3006. — Montagu, Trans. Lin. Soc. xi. 188, pl. 13, fig. 2. — Brown, Ill. Conch. Gr. Brit. 68, pl. 22, figs. 10–12. — Forbes and Hanl. Brit Moll. ii. 357, pl. 57, fig. 10. — Lovèn, Ind. Moll. Scand. 29.

A single specimen, obtained by Mr. Willis at St. Margaret's Bay, seemed to me to come under this species. The specimen was small and imperfectly examined. It was rounded-ovate, rather globose, thin and translucent, the surface without grooves, but finely punctured; color yellowish-white. The more minute characters were not noted.

Class GASTEROPODA.

HEAD distinct, furnished with eyes and tentacles. Body usually protected by a conical or spiral shell. Lower part of body formed into a thickened, expanded, creeping disk or foot.

Sub-Class OPISTHOBRANCHIATA.

GILLS exposed, or only slightly covered by a fold of the mantle situated behind the heart, and never lodged in a distinct cervical cavity. Sexes united in the same individual. Abdomen rudimentary, not spirally developed in the adult, or protected by a shell. Larva shell-bearing, and furnished with deciduous cephalic fins.

ORDER TECTIBRANCHIATA.*

GILLS forming a tuft or plume on one side, towards the hind part of the body, under a fold of the mantle, and usually protected by a shell. Both the adult animal and larva shell-bearing. Foot elongate, formed for walking. Marine.

FAMILY BULLIDÆ, D'ORBIGNY.

SHELL thin, usually rolled up like a scroll; animal destitute of tentacula, and having the branchiæ in a special cavity, at the posterior part of the back, covered by the mantle.

* In Dr. Gould's MS. the only work done on this order was pasting on separate sheets the descriptions of each species of the first edition, and adding a sheet for each additional species which he wished represented in the second edition. These additional sheets I have filled up with a copy of the original description of each species. In case of both new and old species, I have added the notes in Dr. Gould's interleaved copy of the first edition. The only thing for which I am alone responsible is the synonymy and the generic descriptions, which last are copied from the "Genera of Recent Mollusca." — W. G. B.

Genus PHILINE, Asc. 1772.

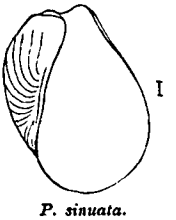
ANIMAL investing the shell. Eyes, none. Foot, not produced posteriorly, the side lobes large and fleshy. Shell concealed in the mantle, loosely convolute, thin, fragile, sub-orbicular or ovate, striate, or punctate; spire small, often concealed; aperture very wide and open; outer lip patulous.

Philine sinuata.

Philine sinuata, STIMPSON, Proc. Bost. Soc. iii. 333 (1850); Shells of New England, 51, pl. 1, fig. 7 (1851); Check Lists, 4 (1860).

Shell minute, ovate, white, pellucid, longitudinally striate; spire conspicuous; aperture anteriorly dilated. Length, seven one hundredths of an inch; breadth, five one hundredths of an inch.

Fig. 502.



P. sinuata.

The animal is two tenths of an inch in length, oblong, elongated, convex posteriorly, of a yellowish color, darkest behind, with dots and patches of white. The reflected pedal lobes are rather narrow, and terminate near the middle of the part occupied by the shell. At the posterior extremity a cavity is formed by the mantle, which is digitated and arched; within this cavity the anus is situated, and its lower margin has a notch at the centre.

The ova are deposited during the latter part of August. They are minute, white, and enveloped in a gelatinous mass, which is globular, hyaline, slightly tinged with yellowish, and somewhat larger than the animal itself.

Several specimens of this species were obtained by dredging in Broad Sound, Boston Bay, at the depth of from four to seven fathoms on a sandy bottom (*Stimpson*).

Philine quadrata.

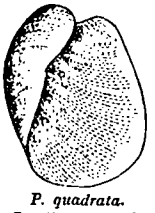
Philine quadrata, SEARLES WOOD, Mag. Nat. Hist. New Series, iii. 461, pl. 7, fig. 1 (1839). — FORBES and HANLEY, Brit. Moll. iii. 541, pl. 114, E, figs. 2, 3. — STIMPSON, Check Lists, 4 (1860).

Philine formosa, STIMPSON, Proc. Bost. Soc. Nat. Hist. iii 334 (1850); Shells of New England, 51 (1851).

Shell minute, squarely globose, sub-truncated anteriorly, white, shining, sub-opaque, thickened posteriorly, punctured with inequi-

distant, revolving, sometimes undulating striæ; apex circularly and deeply excavated, columella sinuose, broadly and lightly callous; lip crenulated posteriorly; aperture very wide. Length, eighteen hundredths of an inch; breadth, fourteen hundredths of an inch (*Stimpson*).

Fig. 503.



P. quadrata. Greatly enlarged.

Several specimens were taken from fishes caught on the "Middle Bank," in seventeen fathoms; in thirty fathoms off Cape Ann, and in deep water off the coast of Maine (*Stimpson*); Zetlands, &c. (*Forbes and Hanley*); Greenland (*Mörch*).

Philine lineolata.

FIG. 99.

Shell minute, ovate, ferruginous; whorls three, the last enveloping all the others, and marked with numerous revolving lines; aperture dilated anteriorly.

Bul'a lineolata, COUTHOUY, Bost. Journ. Nat. Hist. ii. 179, pl. 3, fig. 15 (1839); Am. Journ. Sc. 1st ser. xxxvi. 389 (1839). — GOULD, Inv. 169, fig. 99, (1841). — DE KAY, N. Y. Moll. 16, pl. 35, fig. 334 (1843).
Philine lineolata, STIMPSON, Check Lists, 4 (1860).

Shell very small, oblong-ovate, broadest anteriorly, very thin, and fragile, covered with a thin, rust-colored epidermis; whorls three, forming a flattened spire, the outer one somewhat inflated, and delicately marked with numerous, impressed, revolving lines; aperture extending the whole length of the shell, very narrow behind, and rapidly widening forwards, so that the lip is broadly rounded in front; the pillar has a faint oblique fold near the middle. Within glossy, yellowish-white. Length, three twentieths of an inch; breadth, three fortieths of an inch.

Fig. 504.

P. lineolata.

Several specimens of this very delicate and very singular shell have been taken from the stomachs of fishes caught in Massachusetts Bay; Cape Cod northward to Grand Manan (*Stimpson*); Fishing Banks, rare (*Willis*).

It appears like a diminutive specimen of *Bulla lignaria*, but its somewhat elevated spire is one good distinctive mark. The revolving lines are rather distant, regularly disposed, and always conspicuous under a magnifier.

Genus SCAPHANDER, Montf. 1810.

Animal not investing the shell. Eyes, none. Foot ample, but short, the side-lobes small.

Shell ovate-pyriform, convolute; spire distinct, depressed, somewhat concealed; aperture very wide, narrowed behind, entire and dilated in front; inner lip spirally convoluted as far as the commencement of the spire; outer lip simple, acute.

Scaphander puncto-striatus.

Shell white, solid, elegantly striated with inequidistant, numerous rows of punctures; spire hidden, aperture large.

Bulla puncto-striata, Mighels and Adams, Bost. Journ. Nat. Hist. iv. 43, pl. 4, fig. 10 (1842); Proc. of same, i. 49 (1841).
Scaphander puncto-striata, Stimpson, Check Lists, 4 (1860).

Shell white, rather solid, ovate, with crowded inequidistant, distinctly punctate striæ; spire concealed, aperture very large, contracted at the upper third by the intrusion of the body whorl; labrum rising above the apex, very sharp and regularly arcuate; labium with a very thin lamina extending to the apex. Length, thirty-eight hundredths of an inch; breadth, twenty-four hundredths of an inch.

Fig. 505.

S. puncto-striatus.

Casco Bay; taken from the stomach of a haddock, in the summer of 1841.

This remarkable and truly beautiful shell resembles an enlarged specimen of *B. lineolata*, Couth., to which it is allied; but it is easily distinguished by its larger size, by the elevation of the labrum above the apex, and, above all, by the punctate striæ. Only a single specimen has been found. It is in the cabinet of J. W. Mighels (*Mighels* and *Adams*).

Fishing Banks (*Willis*).

Genus DIAPHANA, Brown. 1833.

Head disk broad and short; tentacular lobes short, conical, lateral, wide apart; eyes immersed in their hind bases. Mantle margin slightly thickened. Foot short, bi-lobed behind.

Shell thin, hyaline, sub-umbilicated, inflated, ovate or sub-globose; spire depressed, with a mammillated nucleus; aperture expanded, not extending beyond the body whorl; columella reflexed and sinuose; outer lip sinuose, produced anteriorly.

Diaphana hiemalis.

FIG. 100.

Shell minute, globular, very thin, dusky, no spire perceptible, with a small umbilicus.

Bulla hiemalis, COUTHOUY, Bost. Journ. Nat. Hist. ii. 180, pl. 4, fig. 5 (1839). — DE KAY, N. Y. Moll. 18, pl. 35, fig. 335. — GOULD, Inv. 163, fig. 100.
Diaphana hiemalis, STIMPSON, Check Lists, 4 (1860).

Shell globular, very thin and brittle, transparent, of a brownish tinge, except near the tip, where it is whitish; body whorl enveloping all the rest, so as to leave no perceptible spire, and marked with the lines of growth; the aperture is narrow behind, but greatly enlarged forwards; the outer lip revolves, from its junction behind, nearly a third of a revolution before it turns forwards; a thin plate of callus is spread over the inner margin, and rises so as to form a small but distinct umbilicus. Length and breadth, about one tenth of an inch.

Fig. 506.

D. hiemalis.

Procured from codfish taken off Provincetown, in about thirty fathoms water; Grand Manan (*Stimpson*); Bristol, Maine.

It is a remarkable shell, sufficiently distinguished by its globular form and its peculiar lip.

Diaphana debilis.

FIG. 95.

Shell obliquely ovate, small, transparent, inflated, smooth, partially umbilicated; whorls four, terminating on a level; pillar lip terminating abruptly in front.

Bulla debilis, GOULD, Silliman's Journ. Old Series, xxxviii. 196 (1840); Inv. 164, fig. 95. — DE KAY, N. Y. Moll. 17, pl. 35, fig. 329.
Diaphana debilis, STIMPSON, Check Lists, 4 (1860).

Shell small, obliquely ovate, tumid, thin and brittle, greenish-white; whorls four, all rising to about the same height, division distinct, each very convexly rounded; last whorl the whole length of the shell, including all the others, and partially detached from them above; surface without apparent marks; aperture as long as the shell, widening from behind forwards; outer lip attached behind, a little before the summit of the shell it rises to a level with the spire, and then descends in a regular though slightly waved curve to the front of the pillar, where it terminates quite abruptly; inner lip spread out in a thin

Fig. 507.

D. debilis.

enamel upon the body of the shell, partially covering an umbilical indentation placed at about one fourth the length of the shell. Length, one tenth of an inch; breadth, one eighth of an inch.

Obtained from fishes taken in Massachusetts Bay. Connecticut (*Linsley*); Grand Manan (*Stimpson*); Maine (*Mighels*); Greenland (*Mörch*).

This shell has no marked resemblance to any other with which I am acquainted, unless it be to *B. Gouldii*, of which it may possibly be the young. It is, however, much smaller and thinner, more globular, and its greatest breadth is before, instead of behind, the middle. The peculiarity of the base, also, is well marked. In many respects it has a general resemblance to Montagu's *B. diaphana* (*Test. Brit.* pl. 7, fig. 8), but that has an elevated spire, and is not umbilicated. Brown figures a shell, which he calls *Diaphana pellucida* (*Conch. of Great Brit.* &c., pl. 38, figs. 10, 11), which bears a still more striking resemblance.

These two last-named species would come under the sub-genus *Aplustra* of Blainville; in which the whorls are all visible, but the spire not projecting; and in which there is a thickened portion at the anterior termination of the pillar.

Genus UTRICULUS, Brown. 1844.

Head disk very short; tentacular lobes lateral, rounded; eyes, none.

Shell rather thin, sub-cylindrical, imperforate, covered with an epidermis; spire distinct; apex obtuse, not mammillated, sutures simple, not canaliculated; aperture narrow behind, dilated and entire in front, nearly as long as the body whorl; columella simple, not plicate; outer lip straight, acute.

Utriculus Gouldii.

Fig. 94.

Shell ovate, white, rather opaque, composed of four whorls, the last including all the others, and covered with minute revolving lines; spire nearly flat.

Bulla Gouldii, Couthouy, Bost. Journ. Nat. Hist. ii. 181, pl. 4, fig. 6 (1839). — Gould, Inv. 163, fig. 94. — De Kay, N. Y. Moll. 15, pl. 5, fig. 101.
Utriculus Gouldii, Stimpson, Check Lists, 4 (1860).

Shell small, ovate, shining, of a dead white color, covered with a yellowish epidermis; whorls four, rounded at their upper edges,

their dividing line well marked; the last whorl is as long as the shell, and includes all the others; under the magnifier its surface appears covered with revolving lines; the whorls all rise to about the same level, so that the summit is nearly flat; the anterior extremity is rather narrower than the posterior; the aperture is narrow behind, and suddenly enlarged by the curvature of the inner margin, which is a little thickened, white, and polished. The outer lip, from its junction behind, advances a little as it turns forward by a regular curve, and, finally turning backward by a rather sharp turn, it joins the body of the shell with a gentle twist; umbilicus none. Length, three tenths of an inch; breadth, three twentieths of an inch.

Fig. 508.

B. Gouldii.

Found by Mr. Couthouy, in the stomachs of fishes taken off Cohasset Rocks, and dredged by Colonel Totten in Provincetown Harbor. Cape Cod, northward (*Stimpson*).

In shape it somewhat resembles *Bulla solitaria;* but it is a smaller and much more solid shell, and its flat summit, with the display of all its whorls there, plainly distinguishes it. The anterior extremity is also more pointed. It is much broader and less cylindrical than *U. canaliculatus*, nor has it the conspicuous fold on the pillar, as that shell has.

Utriculus pertenuis.

Shell minute, cylindrical, white, hyaline; whorls four, spire elevated, lip straight above, rounded below; aperture narrow above, wide below.

Bulla pertenuis, MIGHELS, Bost. Proc. i. 129 (1843); Bost. Journ. iv. 346, pl. 16, fig. 3 (1843).
Utriculus pertenuis, STIMPSON, Check Lists, 4 (1860).

Shell very small, cylindrical, of a dingy white color, very thin and fragile; whorls four, rounded, all lying in the same plane; suture distinct, as seen under the microscope; spire elevated; labrum nearly straight at the posterior part, rounded anteriorly, returning into the shell it forms a delicate, slightly elevated lamina, which, under the microscope, is seen to occupy nearly the whole length of the columellar region; aperture very narrow posteriorly, broad and rounded anteriorly. Length, eight one hundredths of an inch; breadth, four one hundredths of an inch.

Fig. 509.

U. pertenuis.

When greatly magnified this shell resembles *Bulla Gouldii*, Couth., but besides being much smaller, it is proportionally longer;

it is also entirely destitute of the revolving lines, which are seen on that shell. It is the smallest species of the genus that has hitherto been found on the American coast. I first detected it in sifting sand and mud taken from the stomachs of haddock in the spring of 1842. It is scarce and difficult to obtain (*Mighels*).

Casco Bay (*Mighels*); Cape Cod to Grand Manan (*Stimpson*).

Utriculus canaliculatus.

FIG. 97.

Shell nearly cylindrical, spire somewhat elevated, with a groove on the summit of the whorls.

Volvaria canaliculata, SAY, Journ. Acad. Nat. Sc. v. 211 (1822); ed. BINNEY, 121.
Bullina canaliculata, SAY, Amer. Conch. pl. 19 (1832); ed. BINNEY, 193, pl. 39.
Bulla canaliculata, GOULD, Inv. 166, fig. 97. — DE KAY, 19, pl. 35, fig. 328.
Bulla obstricta, GOULD, Sillim. Journ. 1st series, xxxviii. 196 (1840); Inv. 167, fig. 96. — DE KAY, N. Y. Moll. 15, pl. 5, fig. 102.
Utriculus canaliculatus, STIMPSON, Check Lists, 4.

Shell cylindrical, white, and shining, with very faint lines of growth; spire a little elevated, crowned with a minute but prominent tip; whorls about five, the summit of each having a shallow, rounded groove; outer lip arching forwards; inner lip overspread with a thin plate of enamel, and having a single oblique fold near the base.

Fig. 510.

U. canaliculata.

I have found only one specimen of this shell from the waters of Massachusetts. This was discovered, among other minute shells, in sand brought from Martha's Vineyard. Prof. Adams found them in considerable numbers in New Bedford Harbor. Massachusetts Bay, southward (*Stimpson*); Connecticut (*Linsley*); South Carolina (*Say*).

Bulla obstricta, now considered a synonyme, was thus described in the first edition: —

Bulla obstricta. Shell oval-cylindrical, white, nearly smooth, spire somewhat elevated, last whorl nearly as long as the shell, and slightly girted at the middle; a fold on the pillar. (Fig. 96.)

Shell small, cylindrical, with each extremity rounded, semi-transparent, opaque white, or pale horn-color; whorls five, the last nearly involving the others, somewhat girt in at the middle, nearly smooth, covered with a light-yellowish epidermis; spire obtuse, rising above the junction of the lip to about one fifth the length of the shell; suture deep, apparently double in old specimens, or rather, a narrow and deep line revolving on the shoulder of each whorl, near the suture, forms a sort of channel; aperture very narrow behind, widening before; outer lip sharp, entire, joining the preceding whorl by a gradual approach, and then turning down the inner border in the form of a thick, slightly attached plate of enamel; from the front, as it turns back, it becomes thicker and rounded,

and at the umbilical region it enters the shell and forms a conspicuous fold. Length, seven fortieths of an inch; breadth, four fortieths of an inch.

Found on Chelsea Beach by myself, at Provincetown by Colonel Totten, at New Bedford by Professor Adams, and is not unfrequently taken from fishes.

The same remarks which were made under the preceding species, as to its generic place, apply to this species.

This shell closely resembles the figures, and agrees in general with the description, of *Bulla obtusa*, of Montagu; but in neither of them is any fold at the base of the pillar noted, and our shell has a more elevated spire, and wants the conspicuous lines of growth which peculiarly mark the British shell. *B. canaliculata* differs in its more slender, cylindrical, and smooth appearance, the broad and shallow groove of the whorls, its very acute summit, and its more slightly plaited pillar-lip. In adult specimens it is easy to discriminate the two species; but the half-grown specimens are so nearly alike as to render it almost impossible to separate them. Mr. Lea describes and figures a fossil species in his "Contributions to Geology" under the name of *Actæon Wetherilli*, which must very closely agree with this shell.

Genus CYLICHNA, Lovèn. 1846.

Tentacular lobes connate, indistinct; eyes sessile on their front bases. Mantle with a thick, posterior lobe, partially closing the aperture of the shell.

Shell solid, cylindrical, involute; spire none, apex obtuse, umbilicated; aperture narrow and linear, as long as the body whorl; inner lip callous, with a single anterior fold; outer lip straight, simple.

Cylichna alba.

Fig. 98.

Shell cylindrical, smooth, whitish, of the size of a grain of rice, a pit in place of the spire.

Volvaria alba, Brown, Conch. iii. 3.
Bulla triticea, Couthouy, Bost. Journ. Nat. Hist. ii. 88, pl. 2, fig. 8 (1838); Sillim. Journ. Old Series, xxxiv. 217 (1838). — Gould, Inv. 165, fig. 98. — De Kay, N. Y. Moll. 17, pl. 35, fig. 326.
Bulla corticata, Möller, Ind. Gr. 6.
Cylichna alba, Stimpson, Check Lists, 4.

Shell cylindrical, polished, rather solid, of a dull white color, and covered with a thin, rusty epidermis; marks of growth very delicate, and numerous minute revolving lines may be seen under a magnifier; a circular pit occupies the region of the spire, from the margin of which the outer lip takes its origin, and, rising a little, passes forward in a direction nearly parallel to the left margin of the shell, forming a long, narrow aperture, which suddenly becomes double this breadth, near the

Fig. 511. *C. alba.*

front, by the curvature of the inner lip; occasionally the lip is a little waved inwards at the middle, narrowing the aperture; at the region of the umbilicus is a flattened, white space, thickened by enamel, gradually disappearing within the aperture; the whole inner margin is sometimes slightly coated with enamel. Length, one fourth of an inch; breadth, one tenth of an inch.

Found plentifully in the maws of fishes taken in Massachusetts Bay. Connecticut (*Linsley*); Grand Manan (*Stimpson*); Maine (*Mighels*); Greenland (*Mörch*); Fishing Banks (*Willis*).

This shell is analogous to the *Bulla cylindracea* of Pennant (*Brit. Zool.* pl. 70, fig. 85). But that is a much longer shell, and decidedly umbilicated in the region of the spire. Brown figures a shell under the name of *Volvaria alba* (*Conch. of Great Brit.*, &c., pl. 38, figs. 43, 44), which bears a striking resemblance to this shell. [It is now considered identical.

Cylichna oryza.

FIG. 93.

Shell minute, white, glossy, sub-oval, last whorl enveloping all the others, and marked with a few revolving lines; summit depressed, imperforate.

Bulla oryza, TOTTEN, Silliman's Journ. Old Series, xxviii. 350, fig. 5 (1835). — GOULD, Inv. 168, fig. 93. — DE KAY, N. Y. Moll. 18, pl. 31, fig. 327.
Cylichna oryza, STIMPSON, Check Lists, 4 (1860).

Shell not very small, not very thin, translucent, white, regularly diminishing from the middle towards each end, the tip being depressed into a shallow pit, and the front being rather pointed; last whorl enclosing all the others; surface marked with minute lines of growth, a few revolving lines on the anterior portion, and a few more obscure ones near the shoulder, none of them perceptible without a magnifier. Aperture as long as the shell, narrow behind, and widening forwards; outer lip simple and sharp, commencing beyond the axis of the shell, and rising a little, then turns, and passes forwards by a regular curve; the left margin is thickened and forms a smooth, glossy pillar, which is twisted so as to form an oblique fold; at the base it terminates abruptly, so as almost to form an obtuse tooth; a thick callus, commencing at the junction of the outer lip, runs round within the whorl, giving strength to the region of the spire. There is no umbilical opening either at the tip or base. Length, three twentieths of an inch; breadth, one tenth of an inch.

Fig. 512.

C. oryza.

Found by Professor Adams in the mud of New Bedford Harbor. It was originally found by Colonel Totten in the harbor of Newport.

Maine (*Mighels*); New Bedford (*Stimpson*); Connecticut (*Linsley*). Fossil, Montreal (*Dawson*); Buzzard's Bay, southward (*Stimpson*).

In solidity, color, polish, and general shape, this is allied to *Utriculus Gouldii;* but is much smaller, and is at once distinguished by its exhibiting no spire.

Genus BULLA, Lin. 1759.

Eyes conspicuous, sessile on the middle of the frontal disk. Mantle with the outer margin forming a thick, fleshy lobe. Foot with the lateral lobes moderate, and the hind part not extending beyond the shell.

Shell convolute, ovate or sub-globose, smooth, mottled; spire involute, sunken, causing the apex to be tubular or perforate; aperture extending the entire length of the body whorl; inner lip simple; columella none; outer lip acute.

Bulla incincta.

Bulla incincta, Mighels, Proc. Bost. Soc. i. 188 (1844). — Stimpson, Check Lists, 4 (1860).

Shell small, cylindrical, opaque, white; whorls three, the first slightly depressed, the last distinctly girded above the middle; epidermis yellowish; spire obtuse, elevated; suture canaliculate; aperture narrow behind, wide and rounded before; right lip sharp, entire, advanced in the central region, with a fissure posteriorly. Length, three twenty-fifths of an inch; breadth, three fiftieths of an inch. Casco Bay (*Mighels*).

Bulla solitaria.

Fig. 92.

Shell oval, bluish-white, fragile, the last whorl enveloping all the others, and covered with minute, regular, revolving lines, with an imperfect opening in the region of the spire.

Bulla insculpta, Totten, Silliman's Journ. xxviii. 350, fig. 4. — Gould, Inv. 162, fig. 92. — De Kay, N. Y. Moll. 14, pl. 5, fig. 100.

Bulla solitaria, SAY, Journ. Acad. Nat. Sc. Phila. ii. 245 (1822); ed. BINNEY, 84. — STIMPSON, Check Lists, 4 (1860).

Shell oval, rather broadest before the middle, thin, pellucid, bluish-white; the last whorl enveloping all the others, wrinkled lengthwise, and covered with minute, close, revolving lines; the region of the spire is depressed, and sometimes we find there a very small opening; aperture narrow behind, broad before; outer lip very sharp, rising in a regular curve backwards above the summit of the shell; as it ascends from below upon the body of the shell it becomes a little thickened, and forms a very slight fold at the umbilical region; a very thin layer of enamel is found covering the inner margin; umbilicus none. Length, one third of an inch; breadth, one fourth of an inch.

Fig. 513.

B. solitaria.

Found at Martha's Vineyard, at New Bedford, and in the muddy inlets in Roxbury; Massachusetts Bay, southwards (*Stimpson*); South Carolina (*Ravenel*); Connecticut (*Linsley*).

The differences between *B. solitaria* and *B. insculpta*, if there be any, must be very slight. Nor do I see that the two descriptions are at all inconsistent with each other. Still, it is true that the shells from Martha's Vineyard are precisely like some from Charleston, South Carolina, and accord with Mr. Say's *solitaria;* and those from Roxbury are precisely like those found by Colonel Totten at Newport, Rhode Island, and described by him. The observable differences are, that the first are of a more dead white, are more cylindrical, the summit has a more square appearance, the revolving lines are less distinct, and there is always a perceptible opening in the region of the spire. These differences may be ascribed to age or locality. I have used Colonel Totten's name, since I am not sure that it is the shell intended by Mr. Say. [It is now acknowledged to be identical.

Bulla occulta.

Shell small, ovate-cylindrical; spire hidden; lip elevated above, straight in the centre; aperture rather narrow, wide below, rounded.

Bulla occulta, MIGHELS and ADAMS, Journ. Bost. Soc. iv. 54, pl. 4, fig. 11 (1842); Proc. i. 50 (1841).
Bulla Reinhardi, MÖLLER, Ind. Moll. Gr. 6 (1842); teste GOULD, in MSS.

Shell small, of a dingy white color, ovate-cylindrical, covered with very minute, transverse striæ, and with indistinct striæ of

Fig. 514.

B. occulta.

growth; spire concealed; labrum extends a little below the spire, nearly straight above the centre, regularly rounded below and at base; aperture narrow at the upper part, rather broad at the base. Length, one fifth of an inch; breadth, three twentieths of an inch. (*Mighels* and *Adams.*)

Westbrook, Maine, fossil. Recent in New England and Greenland.

Genus TORNATELLA, Lam. 1812.

Head depressed, with a quadrate disk, bi-lobed in front, with broad, posterior, tentacular lobes; eyes sessile on the middle of the head; mantle included within the shell; foot oblong, truncate in front, obtuse behind.

Shell oval, spirally grooved, whorls few; aperture long, narrow, rounded before; outer lip thin, inner lip spirally twisted to form a fold.

Tornatella puncto-striata.

Fig. 188.

Shell minute, white, sub-oval; whorls four or five, the lowest one large, the lower half marked with revolving, punctured lines; suture deep; fold of columella distinct.

Tornatella puncto-striata, Adams, Bost. Journ. Nat. Hist. iii. 323, pl. 3, fig. 9 (1840). — De Kay, N. Y. Moll. 127, pl 7, fig. 143. — Stimpson, Check Lists, 4 (1860).
Actæon puncto-striata, Stimpson, Shells of New England, 51.

Shell minute, white, elongated-oval, inclining to ovate; whorls four, perhaps five, the lowest one at least three fourths the length of the shell, distended, the portion above the aperture plain and smooth, the remainder marked with ten to fifteen deep, rather distant revolving lines, which are indented with minute punctures; the other whorls form a short, rapidly diminishing spire, and each of them is flattened so as to form a shoulder at the suture, which is deep and somewhat channelled. Aperture narrow, two thirds the length of the lower whorl, widening downwards; outer lip sharp and simple, regularly curved, not very broadly rounded at base; pillar thickened, exhibiting a prominent fold; umbilical region depressed, and in immature specimens it is open. Length, one tenth of an inch; breadth, three fortieths of an inch; divergence, sixty degrees.

Fig. 515.

T. puncto-striata.

Found by Professor Adams in mud dredged up from New Bedford Harbor. Connecticut (*Linsley*).

This is the smallest species hitherto described, but it bears every mark of maturity. It has a general resemblance to the *T. tornatilis*, of Europe, but the spire is shorter and less acutely pointed. The punctured revolving lines, which cover the anterior half of the lower whorl, are constant and decisive marks of distinction, in addition to its minute size.

Order NUDIBRANCHIATA.*

Gills exposed, or contractile into cavities on the surface of the mantle. Adult animal without any shell. Larva shell-bearing. Foot elongate, formed for walking. Sexes united.

While the numerous tribes of Mollusks furnished with testaceous coverings offer us objects of contemplation, remarkable alike for their extreme beauty and the durability of their calcareous envelopes, the scarcely less extensive and certainly far less known families of Naked-gilled *Gasteropods* exhibit an astonishing variety of form, extreme delicacy of organization, and great diversity of color, to captivate the eye and occupy the attention of those who wander by the shore or explore the depths of ocean. Clinging to the stems of floating sea-weeds, many, like the *Anthobranchs*, will be seen extruding their flower-like gills of surpassing elegance, exploring with their foliated tentacles or complex mantle-filaments the plants around them, the brilliant hues of their striped or spotted bodies glancing through the water; some will be observed with bodies so fragile and pellucid that you may see the color of their blood and count the pulsations of their hearts; some will be seen to have their gills disposed in rows of papillary tubercles on the sides of their bodies, like the *Æolids*, or tree-like, and branching, like the *Tritonias;* the foreheads of some will be smooth and simple, while those of others will be found adorned with various singular appendages; in others, again, all processes will disappear, all branchial arrangements vanish, and we shall meet with forms almost as simple in

* The manuscript of the *Nudibranchiata* was left by Dr. Gould quite ready for the press. I have inserted a few additional references to American authors, and descriptions of families from the "Genera of Recent Mollusca."

The original drawings from which the figures in the plates were copied have also passed through Dr. Gould's hands, and were selected by him for engraving. I am responsible only for the grouping of the figures. — W. G. B.

their structure as the *Nemertoid* types among the *Annelids*. In their embryonic state these lovely fragile Mollusks are supplied with little, clear, spiral shells, and swim like *Pteropods* freely through the water, being furnished, at this epoch of their lives, with two head fins and a large frontal veil. As they grow, however, the shell falls off, and the veil becomes modified, but is usually persistent in the adult. They are universally distributed throughout all seas.

Family DORIDIDÆ.

Teeth, many in each cross series, sub-similar, inner often smaller. Mantle-edge simple; gills surrounding the vent, on the middle of the hinder part of the back, in a common cavity.

The *Dorididæ* form an assemblage of most attractive *Nudibranchs*, which may be easily studied by placing them in glass reservoirs of salt-water, as they are by no means shy, but extend their tentacles and display their branchial plumes to great advantage. In this family the gills are retractile into a common cavity, and the mantle is very large, either entirely or almost covering and concealing the foot.

Genus **POLYCERA**, Cuvier. (1817.)

Animal smooth or tuberculated. Tentacles clubbed and pectinated, not retractile and without sheaths. Frontal veil consisting of a series of tentaculiform appendages variable in number, often extending along the borders of the mantle. Branchiæ forming part of a circle around the vent, encased by membranous laminæ which protect them.

Polycera Lessonii.

Plate XVII. Figs. 242–248.

Animal yellowish-green, with tubercles tipped with sulphur yellow; tentacles short, obtuse, clubbed, with twelve to thirteen oblique laminæ; veil small, about twelve-lobed; appendages to the branchiæ spur-like, or obsoletely branched, yellow.

Polycera Lessonii, D'Orb. in Mag. de Zool. vii. 5, pl. 105 — Adams, Genera, pl. 62, fig. 9. — Alder and Hanc. Nudib. Moll. in Ray Soc. fam. 1, pl. 24. — Chenu, Man. de Conch. i. 403, fig. 3040.

Polycera citrina, Alder, in Ann. Nat. Hist. vi. 340, pl. 9, figs. 7–9 (young) (1841).

Polycera modesta, Lovèn, Index Moll. Scand. 6 (1846).

Doris illuminata, GOULD, Inv. Mass. (1st ed.) 4 (1841). — DE KAY, N. Y. Moll. 8 (1843). *Polycera illuminata*, STIMPSON, Check Lists, 4 (1860).

Animal prismatic, somewhat four-sided, the back arched, somewhat contracted back of the tentacles, a little dilated around the gill-tuft, then rapidly tapering to a point. Color pale yellowish, thickly dotted with green so as to give a general greenish effect. A sharp ridge or narrow fringe runs along the sides of the back, bearing six tubercles on each side, and making the body quadrate between the tentacles and gills; another range of tubercles runs the whole length of the animal on the median line; also scattered tubercles on the sides and tail, more or less in lines; all these are sulphur yellow. The head is nearly semicircular, and with a hood having six projecting points on each side. Mouth strongly pursed. Tentacles short, moderately clubbed, with twelve or thirteen oblique crowded laminæ. Eyes very minute. Branchial plumes three, with a small supplementary one each side, doubly pinnate, having at the base three elongated yellow tubercles. Foot pale, square in front, slightly dilated at angles, advancing a little before the head in progression, sides parallel, rather blunt posteriorly. Spiculæ of the skin elongated, cylindrical, knobby. Length, three fourths of an inch; breadth, one fourth of an inch.

Found in the Bath-house, Craigie's Bridge, Boston, and at Aspinwall's Mast-yard, in considerable numbers. It is a very common animal on the English coasts; has been found in Sweden by Professor Lovèn; and was originally discovered by D'Orbigny, near Rochelle, France.

It is a beautiful animal, rather sluggish in its movements. Alder states that it inhabits the region of Corallines, and is found almost exclusively on *Gemellaria loriculata*, which appears to be its favorite food.

Genus **DORIS**, LINNÆUS. 1758.

BODY elliptical. Cloak covering the head and foot. Dorsal tentacles two, laminated, retractile within cavities. Oral tentacles two, various or wanting. Branchiæ on the median line of the back.

(SECTION 2. — Branchiæ simply pinnate, set separately in an open circle, non-retractile; oral tentacles replaced by a veil. LAMELLIDORIS.)

Doris bilamellata.

PLATE XXI. FIGS. 299, 305–309. PLATE XX. FIGS. 285, 286.

Body elliptical, covered with pestle-shaped papillæ, whitish varied with rusty brown or flesh color and opaque white; branchiæ twenty to twenty-five, long, linear, simply pinnate, arranged transversely in an oval, including several tubercles.

Doris bilamellata, LIN. Syst Nat. (12th ed.) i. 1083. — JOHNST. in Ann. Nat. Hist. i. 53, pl. 2, fig. 8. — THOMPS. Ibid. v. 86. — MCGILLIV. Moll. An. Aberd. 198. — FORBES and HANL. Brit. Moll. iii. 567. — ALDER and HANCK. Monog. Br. Nudib. Moll. 43, Fam. I. pl. 11.

Doris fusca, MULLER, Zool. Dan. Prodr. 229, No. 2768? Zool. Dan. pl. 47, figs. 6–9.

Doris verrucosa, PENNANT, Brit. Zool. iv. 43, pl. 21, fig. 23. — TURTON, Brit. Fauna, 133. — FLEMING, Brit. Anim 282.

Doris vulgaris, LEACH, Syn. Moll. Gr. Brit. 19.

Doris Elfortiana, LEACH, Ibid. 20, pl. 7, fig. 1. — BLAINV. Bull. des Sc. 1806, p. 95 (sec. LEACH).

Doris Leachii, BLAINV. Ibid. xiii. 450 (sec. LEACH).

Doris affinis, THOMPS. in Ann. Nat. Hist. v. 85.

Doris liturata, "BECK," MÖLL. Ind. Moll. Grœnl. 5. — STIMPSON, Check Lists, 4 (1860).

Doris obvelata, BOUCH. CHANT. Cat. des Moll. du Boul. 42.

Doris coronata, AGASSIZ, Proc. Bost. Soc. Nat. Hist. iii. 191 (no description).

Animal elliptical, the sides nearly parallel and the ends equally rounded; pale rusty, or flesh-color, or marbled with the two; surface covered with rather large, unequal, short pestle-shaped protuberances, the tips of the larger ones cream-colored. Tentacles short, somewhat compressed, the upper three fourths obliquely laminated, the laminæ not fully meeting behind, tip knobbed, buff-colored. Branchial plumes long and slender, simply foliated, about twenty-two in number, arranged in an oval across the back, somewhat concave and interrupted posteriorly, and enclosing several tubercles. Edge of mantle serrated by the tubercles. Foot rather narrower than the body, somewhat truncate behind. Head as broad as the foot, crescentic; tail pointed, much narrower than foot, on the middle of which it lies. Length, about an inch; and about half as wide.

Found under a floating log at East Boston, May, 1849. Also by Professor Agassiz at Beverly, in June; also dredged by Mr. Stimpson in Boston Harbor, near Governor's Island, in four fathoms, May 24, 1853. It has been noticed from Greenland by Möller, and in Iceland; also abundantly throughout Northern Europe.

The eggs are excluded in a tape-like mass, which is attached by one edge in a coil of one or two turns. (Pl. XX. figs. 285, 286.)

The spiculæ are slightly elbowed, rounded at the ends, and sometimes having a small spine at the elbow.

This is widely distributed, and very variable in size and color, and also in the number of the branchial plumes; hence the great number of names which have been applied to it. Our specimens vary so much from the figures given by Alder and Hancock that I should hesitate to consider them the same, did not Dr. Stimpson assure me that they are identical with specimens dredged by him on the coast of England.

Doris tenella.

PLATE XX. Figs. 289, 290, 293.

Body ovate, covered with small, pointed tubercles, yellowish-white; branchial plumes six to seven, simple; mantle extended anteriorly beyond the foot, head dilated laterally.

Doris tenella, AGASSIZ, Proc. Bost. Soc. iii. 191 (1850), no description.

Body ovate, broadest in front, of a yellowish-white, translucent color, covered with very numerous small, pointed, opaque white tubercles. Tentacles long and slender, with about fourteen oblique laminæ occupying nearly their whole length. Branchial plumes simple, short, six or seven in number. Foot elliptical, bluntly rounded, extending a little beyond the mantle, lemon-yellow, with a central orange blotch. Head short, rather broader than foot, pointed at angles, and somewhat bi-lobed in front, broadly shielded by the mantle. Length, half an inch; breadth, three eighths of an inch.

Found by Professor Agassiz at Beverly, February, 1848.

The above characters are drawn from a figure made of a single specimen, without any detailed description. The animal is delicate and almost transparent, and quite remarkable for the broad expansion of the anterior part of the mantle beyond the foot, and for the lateral dilatation of the head itself, and its angular form. Were the means at hand of examining the tongue, spiculæ, and other conditions, it might be found identical with some European species. It seems to approach most nearly to *D. inconspicua*, Alder and Hancock, and is not very different from *D. pusilla*.

Doris pallida.

PLATE XX. FIGS. 284, 287, 288, 291.

Body elongated, sides parallel, ends equally rounded, covered with large, mushroom-like tubercles, cream-colored; branchial plumes seven to eight, simple, retractile.

Doris pallida, Agassiz, Proc. Bost. Soc. Nat. Hist. iii. 191 (1849), no description. — Stimpson, Gr. Man. 26.

? Doris fusca, O. Fabr. Fauna Grœnl 344, No. 335, fig. 10 (1780).

Proctaporia fusca, Mörch, Grœnl. Cat. 78; Grönl. Blöddyr, 6 (1857). — Stimpson, Check Lists, 4 (1860).

Doris aspera, Alder and Hancock, in Ann. Nat. Hist. ix. 32; Brit. Nudib. Moll., Fam. 1, pl. 9, figs. 1 - 9 (1854). — Forbes and Hanl. Br. Moll. iii. 567.

Body elongated, elliptical, the sides parallel and the two ends about equally rounded; pale cream-color, with a dusky pear-shaped spot at the central portion of the back; above furnished with unusually large mushroom-like tubercles, somewhat more white and opaque than the general coloration, becoming smaller, more pointed and more numerous towards the margin, so that the edge from beneath is finely toothed. Tentacles long, recurved, with about ten very oblique laminæ and a style at the tip. Branchial plumes seven or eight, retractile into separate sheaths, each plume broad lanceolate, simply pinnate. Foot a little narrower than the mantle. Head as broad as the foot, quite short, crescentic. Length, about half an inch; breadth, one fourth of an inch.

Found by Professor Agassiz at Beverly, February, 1848. Dredged by Stimpson near Governor's Island, Boston Harbor, October, 1849.

This is a well-marked species, on account of its color and large tubercles, as well as its plumes. It is pretty certainly *D. aspera*, Alder and Hancock, but if the exhibition of a colored drawing is a valid claim, the name of Agassiz has precedence. It is a still further question whether this is not *D. fusca* of Fabricius, with whose figure and description it corresponds, though that species has been considered as a synonyme to *D. bilamellata*.

Doris diademata.

Plate XXI. Figs. 298, 300, 301, 302, 303, 304.

Body oblong-oval, slightly broader anteriorly, maroon color, darkened on the sides by numerous dusky points, dark gray below; branchial plumes nine, simple; head short, concentric, pointed.

Doris diademata, Agassiz, Bost. Soc. Pr. iii. 191 (1850), no description.

Body oblong-oval, slightly broadest in front, abruptly rounded at ends, moderately convex; color maroon brown, lightest on the disk, of a darker shade on the sides produced by numerous dusky points; underneath dark gray. Tentacles emerging from a sheath, which has four anterior and one posterior prominence from the margin, laminated about half the length with about fifteen crowded plaits.

Branchial star of nine plumes, simply pinnate, pale at edges and partially folded, about half as wide as the body, the transverse diameter a little the longer. Foot yellow, tinted roseate, about two thirds as wide as the body in front, and projecting a little behind when in motion, bluntly rounded at tip and at the front, which is quite in the rear of the front of the body. Head very short, crescentic, about the width of the foot, pointed at sides. Length, one and a half inches; breadth, nearly an inch.

Found in deep water, Boston and Beverly Harbors (*Agassiz*).

This is the largest species yet found on our shores, and is the representative of *D. tuberculata* of Europe, if indeed it is not identical. But if the drawings may be relied on, the branchial plumes of our animal are much more simple, the tentacles more clubbed and closely plaited, and the margins of the sheaths from which they issue are not simple, as in *D. tuberculata*.

Doris planulata.

PLATE XX. FIGS. 294, 296.

Body broad, mantle expanded beyond the foot, covered with white minute tubercles; white, with a row of irregular bright-yellow spots down each side; branchial plumes ten, small, pinnated.

? *Doris repanda*, ALDER and HANCOCK, in Ann. Nat. Hist. ix. 32; Brit. Nudib. Moll. Fam. 1, pl. 6 (1847).

Doris planulata, STIMPSON, Mar. Invert. Gr. Manan, 26, fig. 14 (1853); Check Lists, 4 (1860).

Body broad, depressed, mantle expanded widely beyond the foot, covered above with minute tubercles, and white with a row of irregular bright-yellow spots down each side just without the margin of the foot. Dorsal tentacles elongated, slender; branchiæ very small, consisting of about ten delicately pinnated plumes. Foot narrow, truncated anteriorly, and extending posteriorly to the edge of the mantle. Mouth very small, with a flat triangular lobe on each side. Length, six tenths of an inch; breadth, forty-five hundredths of an inch.

Found at Grand Manan, and on stones at low water, Passamaquoddy Bay, in July.

Differs but slightly from *D. repanda*, Alder and Hancock.

The above description is copied from Stimpson. It corresponds so nearly with figure and description of *D. repanda*, Ald. and Han., that I scarcely hesitate in regarding them as indicating the same species.

Doris pilosa, Müller.

A specimen has been observed and imperfectly sketched by Dr. Stimpson, which might well be referred to this species. It was found at the Navy Yard, Charlestown, 1849.

Doris grisea.

Plate XX. Figs. 292, 295.

Body oblong-oval, covered with blunt processes tipped with stellate clusters of spiculæ; branchial plumes short, yellowish, arranged in a circle around a dark bristle; head short, broad, angular.

Doris grisea, Stimpson, MSS.

Body above oval-oblong, quite convex, and semi-globose when contracted, a little pointed behind when fully extended; back covered with short, blunt processes tipped with stellate clusters of spiculæ, many of them tipped with reddish brown, and with minute farinaceous golden dots at their bases, producing on the whole a general roseate aspect; the sides somewhat darker than the back. Tentacles yellowish, long, blunt, nearly linear, the lower half simple, the upper with ten or twelve fine oblique folds. Branchial plumes yellowish, short, the posterior ones much shorter than the anterior, arranged in a circle, the enclosed area brown, having a dark stilet or bristle protruding from the centre. Head very short and very broad, somewhat angular, seeming to be attached to the mantle only at the median line. Foot much narrower than the mantle and more pointed behind, cream-colored. Motions quite active. Length, one half inch; breadth, one third of an inch.

Found on floating *Zostera* in Charles River, November 9, 1842, and on *Fucus*, Chelsea Beach, May, 1865; on the under side of a fucus-covered stone at East Boston Point, in April (*Stimpson*).

This species is very closely allied to *D. inconspicua*, Alder and Hancock, which has a larger number of laminæ on the tentacles covering a greater length, and has ten plumes. *D. aspera* has also a close general resemblance, but the tentacles are less clubbed and with fewer laminæ, and the papillæ are larger; the branchial plumes are also more numerous.

The figure is copied from an original drawing by Dr. Stimpson.

Family TRIOPIDÆ.

Teeth, many in each cross series (rarely only four), the inner lateral ones large, irregular shaped. Mantle small, edged with tentacular appendages; gills on the middle of the hinder part of the back, in a common cavity, surrounding the vent; vent dorsal.

In this family the body is somewhat angular, and the mantle is distinct and furnished with tubercular appendages; the species of the genera comprising this group constitute some of the most delicate and beautiful forms of *Nudibranchiate* Mollusks.

Genus ANCULA, Lovèn. 1846.

Body elongated, slender; mantle adherent throughout and furnished with styliform dorsal cirri; labial veil produced on each side into a short papilla; tentacles perfoliate, armed with styles at the base.

Ancula sulphurea.

Plate XXII. Figs. 310, 314.

Body long, slender, light brownish; branchial plumes three, arranged in semicircle, anterior largest, doubly pinnate; surrounding tentacular processes eight to twelve, sulphur tipped; oral tentacles long, the processes arising from their very base.

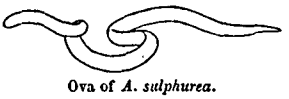
Ancula sulphurea, Stimpson, Mar. Invert. Gr. Manan, 26 (1853); Check Lists, 4 (1860).

Body slender, very light brownish, transparent; dorsal tentacles large, club-shaped, the upper third with about twelve laminæ of a sulphur-yellow color, the appendages arising from the very base, almost as if from the body, and tipped with yellowish brown; oral expansions rather long and tipped yellow; branchial plumes three, arranged in a semicircle, the anterior the largest, doubly pinnate, with a series of dots on the main branches, delicately transparent and sulphur tipped; the main branches surrounding tentaculiform appendages eight to twelve, sulphur tipped. Foot narrow, rounded at the sides, sometimes contracting to a mere line. Length, often an inch and a quarter.

Very common under stones in the Laminarian Zone; Grand Manan, among corallines, on *Zostera*, and under stones in Boston Harbor, June, 1850, and May, 1851 (*Stimpson*).

Very like to *A. cristata*, Lovèn, differing chiefly in its greater size, longer oral tentacles, the lower origin of the tentacular processes, and the greater number of branchial laminæ. Ova in a tape-like envelope, adhering to rocks by one edge, in a loose, serpentine manner. Some specimens are tipped with brown instead of yellow.

Fig. 516.



Ova of *A. sulphurea*.

The figure referred to is from a drawing by Dr. Stimpson.

Family TRITONIIDÆ.

Tongue broad, teeth many in each cross series; jaws horny. Tentacles retractile within sheaths. Gills superficial, fusiform, or branched, on each side of the back. Vent lateral. Foot linear, channelled.

Many of the genera of this family are pelagic, and are often found crawling on the fronds of floating algæ, or clinging to the narrow stems of gulf-weed, which is frequently met with in large masses at considerable distance from the land; these mimic forests, tenanted by their singular Molluscan inhabitants, thus serve in some measure to enliven the solitudes of the ocean.

Genus DENDRONOTUS, Alder and Hancock. 1845.

Tentacles clubbed, lamellar, with branched sheaths; hood of the head furnished with branched appendages. Branchiæ ramose, in a single range along each side of the back.

Dendronotus arborescens.

Plate XXII. Figs. 311, 312, 313.

Animal large, surface somewhat warty, pale reddish, marbled with brown, cream-color and opaque white, occasionally white; front with six branching fringes; branchiæ six or more pairs, elaborately ramose.

Doris arborescens, Müller, Zool. Dan. Prodr. 229. — Fabr. Fauna Grœnl. 346 (1780). — Gmélin, i. 3107, No. 25.

Doris cervina? Gmélin, i. 3105, No. 12.

Tritonia arborescens, Cuvier, Ann. du Mus. vi. 434, pl. 61, figs. 8–10. — Lamarck, An. sans Vert. 2d ed. vii. 454. — Fleming, Brit. An. 284. — Johnst. Ann. Nat. Hist. i. 115. — Gould, Invert. 5.

Tritonia Reynoldsii, COUTHOUY, Bost. Journ. Nat. Hist. ii. 74, pl. 2, figs. 1–4 (1838). — DE KAY, N. Y. Moll. 8, pl. 5, fig. 94 (1843).
Tritonia lactea, THOMP. Ann. Nat. Hist. v. 88, pl. 2, fig. 3.
Tritonia pulchella, ALDER and HANCOCK, Ann. Nat. Hist. ix. 33.
Dendronotus arborescens, ALDER and HANCOCK, Nudib. Moll. in Ray Soc. Fam. 3, pl. 3 (1850). — STIMPSON, Mar. Inv. Grand Manan, 26 (1853). — LOVÉN, Index Moll. Scand. 6 (1846) (*ling. dentic.* pl. 3). — CHENU, Man. de Conch. i. 407, fig. 3059 (1860). — ADAMS, Gen. ii. 65, pl. 64, fig. 7.
Dendronotus Reynoldsii, STIMPSON, Check Lists, 4 (1860).

Body elongated, tapering, rounded above, as high as broad; color very variable, reddish marbled with brown and opaque white, or pale rose color, or white or dark mottled brown; surface somewhat warty; head blunt with a coronet of about six antler-like appendages directed forwards. Tentacular sheaths long, terminating in five ragged fringes, with one at the posterior base also. Tentacles club-shaped, pale yellow, with five or six transverse plates. Branchiæ in six or more pairs, diminishing in size backwards, delicately transparent, with a few opaque spots, contractile, beautifully and intricately arborescent, the number of tufts and branchlets increasing with age. Foot thin and delicate, showing the viscera beneath, adapted for clasping. Heart forming a large swelling between the four anterior branchiæ, pulsating about seventy-five per minute. Eyes exceeding small, on the lateral base of the tentacular sheath. Length, two and three inches or more.

Found on *Tubularia* and elsewhere about the Bath-house, Craigie's Bridge, Boston (*Couthouy*, *Gould*); on rocks and Laminaria in the Harbor (*Stimpson*); Lynn (*Holder*). Fine large specimens, commonly colorless, in all parts of the Laminarian Zone; on rocky bottoms, Grand Manan (*Stimpson*); in tide pools, Kennebunk (*Rev. J. Swan*); quite common in the northern parts of the British Isles (*Alder* and *Hancock*); Scandinavia (*Lovèn*); Greenland (*O. Fabricius*).

This is a most curious and beautiful animal, both on account of its graceful and at the same time fantastic form, and its brilliancy and variety of coloration, which, with varied number and complication of its appendages, mostly from age, has given rise to a number of names. Extended observation, however, has shown that all are forms of the same animal. Its motions are slow, and its great pliability enables it to grasp and make its way over minute stems of plants and zoöphytes with great ease. It also floats easily at the surface in an inverted position. The spawn is issued in a small bobbin-like thread looped into flounces and hung upon zoöphytes, or, when deposited on a plane surface, laid in a regular spiral.

The figure referred to is copied from an original drawing by Mr. B. F. Nutting, the same used by Captain Couthouy for the plate in the Boston Journal.

Family DOTONIDÆ.

Tongue narrow, teeth in a single central series. Tentacles sheathed at the base, retractile. Gills superficial, fusiform on the sides of the back.

The armature of the lingual membrane in this family differs from that of the other groups, in having a single central series of teeth, and the tentacles are retractile, and furnished with sheaths at their bases. There are two genera, which inhabit the Laminarian Zone.

Genus DOTO, Oken. (1815.)

Body elongated, without a mantle. Tentacles elongated, cylindrical, retractile into broad, trumpet-shaped sheaths. Branchiæ numerous, ovate or club-shaped, tubercular, in a single range along each side of the back; a small simple frontal veil.

Doto coronata.

Plate XVI. Figs. 233–237.

Animal yellowish, dotted with red; veil square in front; branchiæ five to seven on each side, ovate club-shaped, bearing several circles of papillæ with dark red tips.

Doris coronata, Gmélin, i. 3105, No. 19.
Tritonia coronata, Lamarck, An. sans Vert. (2d ed.) vii. 454.
Tergipes coronata, D'Orb. in Mag. de Zool. 1837, v. pl. 103.
Scillæa punctata, Bouch. Chant. Moll. de Boul.
Melibœa coronata, Johnst. Ann. Nat. Hist. i. 117, pl. 3, figs. 5–8.
Melibœa ornata, Alder and Hancock, Ann. Nat Hist. ix. 34.
Melibœa arbuscula, Agassiz, in Proc. Bost. Soc. Nat. Hist. iii. 119 (without descr.).
Doto coronata, Lovèn, Arch. Skand. Nat. 151; Ind. Moll. Scand. 7; from Ofver. af K. Vet. Akad. Förh. 1846. — Stimpson, Mar. Inv. Gr. Manan, 26; Check Lists, 4 (1860). — Alder and Hancock, Monog. Nudib. Moll. Fam. 3, pl. 6 (Syn. *D. pinnatifida*, excl.). — Chenu, Man. de Conch. i. 409, fig. 3066. — Woodward, Man. of Mollusca, pl. 13, fig. 11. — Adams, Gen. ii. 70, pl. 65, fig. 5.

Body slender, gradually tapering backwards, convex above, pale rose-color thickly dotted with dark brown; foot as wide as the body. Tentacles thread-like, the sheath simple trumpet-shaped and

obliquely truncated. Branchiæ ovate clavate, attached by a slender base, arranged in a single line of five to eight on each side, the posterior pairs quite small and short, encircled with tubercles which are capable of considerable contraction and elongation, each one tipped with a dark-red spot, sometimes nearly black; its pith is of a similar dark color. Foot pale yellowish, transparent, somewhat bi-lobed in front. Length, about half an inch.

Found at Craigie's Bridge Bath-house; on the piles of the bridge below low-water mark (*Stimpson*); dredged in Vineyard Sound (*Agassiz*); dredged in fifteen fathoms, near Duck Island (*Stimpson*); Nahant (*Alex. Agassiz*); Gloucester (1865) (*Mrs. Smith*).

A beautiful animal, and readily recognized by its club-shaped branchiæ, covered with more or less dark-red dots arranged in circles. It is very variable in color, varying from almost colorless to deep brown, so that several names have been attached to mere varieties. Professor Agassiz had proposed the name *arbuscula** for a specimen found by him; and I myself had chosen the name *lycopodina*, from the resemblance of the branchiæ to the clubs of *Lycopodinus*. It differs from *D. pinnatifida* in not having a range of tubercles along the outer margin of the animal, and in having the branchial tubercles less elongated. In *D. fragilis* the clubs are conelike, the imbricating tubercles not dark pointed.

Fig. 517.

Ova of *D. coronata*. 3/1

Spawn clings to small zoöphytes in large, flattened, convoluted strings, in the early part of June.

Family ÆOLIDIDÆ.

Tongue narrow, teeth in a single central series; jaws horny. Tentacles subulate, simple, rarely ringed, contractile. Gills superficial, fusiform or branched, on the sides of the back. Vent lateral.

In the family of *Æolids* the curious tentacular sheaths, which are present in many of the other tribes of *Nudibranchs*, appear to be altogether wanting; the orifices of the generative system and vent are situated at the right side, and the gills, usually papillose, are arranged in rows along the sides of the back.

* A drawing of Professor Agassiz's original specimen left no doubt in Dr. Gould's mind of the identity of the two. — W. G. B.

Genus ÆOLIS,* Cuvier. 1798.

Four linear tentacles; branchiæ in transverse, crowded rows on each side. Jaws horny; tongue narrow, generally made up of single transverse plates.

Section 1. — *Æolis* proper. Branchiæ numerous, sub-compressed and crowded; angles of foot sharp. Spawn of several undulating coils. Lingual plate broad, uniformly pectinated.

Æolis papillosa.

Plate XVIII. Figs. 257–263.

Animal ovate-oblong, depressed, dusky, or orange colored, dotted with brown, ochreous or white; branchiæ numerous, somewhat compressed, crowded and imbricated, eighteen to twenty-four oblique ranges; dorsal tentacles short, smooth, conical, labial tentacles short and simple; angles of foot slightly prolonged.

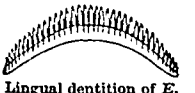
Doris spinis mollibus hirsuta, Baster, Opusc. Subs. i. 81, pl. 10, fig. 1.
Limax papillosus, Lin. Syst. Nat. 12th ed. i. 1082.
Doris Bodoensis, Gunn. Act. Harm. x 170, figs. 1–13?; copied in Encyc. Méth. pl. 82, fig. 12 (sub. nom. *E. Cuvieri*).
Doris papillosa, Muller, Zool. Dan. Prodr. 229. — O. Fabr. Fauna Grœnl. 345 (1780). — Mont. Lin. Trans. xi. 16, pl. 4, fig. 3.
Doris vermigera, Turton, Brit. Faun. 133.
Eolis Cuvieri, Lamarck, An. sans Vert. 2d ed. vii. 450 (syn. excl.). — Bouch. Chant. Cat. des Moll. du Boul. 33. — Stark, Elem. Nat. Hist. ii. 69.
Eolida papillosa, Flem. Brit. An. 285.
Eolida Zetlandica, Forbes and Goodsir, Proc. Br. Assoc. 1839; Athenæum, No. 618, p. 647.
Eolidia papillosa, Johnst. in Loud. Mag. viii. 376, fig. 35; Ann. Nat. Hist. i. 118. — Thomps. ibid. v. 89.
Eolidia Cuvieri, Leach, Syn. Moll. Gr. Brit. 23, pl. 7, fig. 3.
Æolidia Bodoensis, Möller, Ind. Moll. Grœnl. 5.
Æolis papillosa, Lovèn, Ind. Moll. Scand. 7. — McGillivray, Moll. Anim. Aberd. 192.
Æolis Murreyana, McGillivray, Moll. Anim. Aberd. 193.
Æolis Lesliana, McGillivray, ibid. 194.
Æolis rosea, H. and A. Adams, in Ann. Nat. Hist. ix. 34.
Æolis obtusalis, H. and A. Adams, loc. cit.
Æolis papillosa, Forbes and Hanley, Br. Moll. iii. 590. — Dalyell, Pow. Creat. ii. 314, pl. 45, figs. 23–27. — Adams, Genera, ii. 73, pl. 65, fig. 8.
Eolis papillosa, Alder and Hancock, Monog. Fam. 3, pl. 7, 8, 9; pl. 47, fig. 4 (tongue). — Alder, Catal. Monog. Northumb. 20.
Eolis farinacea, Gould, MS. — Stimpson, Grand Manan, 25 (1853).
Æolis farinacea, Stimpson, Check Lists, 4 (1860).

Body broad, depressed, truncate in front, rapidly tapering behind, general color fawn, gray, or yellowish, thickly sprinkled with large

* *Æolis* is more correct than *Eolis*, the orthography adopted by Dr. Gould. — W. G. B.

dots of opaque white, olive, dark brown, purplish or yellowish (as if sprinkled with Indian meal). Dorsal tentacles dark, of the same length as the branchiæ, smooth, rapidly tapering, slightly retractile, truncated at tip, which is yellowish or whitish and appears to be hollow; oral tentacles longer and more slender, brownish cream-color, dotted near tip. Branchiæ lanceolate, compressed, with slight pedicle at insertion, arranged in numerous (twelve to twenty) crowded, imbricated oblique series on each side, about ten to twelve in each series, becoming shorter and paler downwards, somewhat shorter and more crowded near the head, and reaching to the oral tentacles, the exposed surface and edge mottled as before described, the unexposed surface and edge pale flesh-color, tips pale; central portion of the back nearly naked, variously mottled and exhibiting the large sac containing the heart, the pulsations of which (about seventy-four per minute) are distinctly seen. Foot as broad as the body, broad and gently curved in front, with the angles very slightly prolonged, tapering gradually backwards to a very fine point, extending a little beyond the branchiæ; color pale pinkish, transparent. Head large, sub-circular, pale yellowish; mouth pursed; tongue short, broad at base, tapering obtusely to a point, composed of entire, arched plates having their edge simply pectinated with simple denticles.* (Plate XVIII. Fig. 260.) Length, ordinarily, two to three inches (sometimes four); breadth, one third the length.

Fig. 518.



Lingual dentition of *E. papilosa*.

Found among *Actiniæ* and *Tubulariæ* in the Bath-house, Craigie's Bridge, Boston, in April and May; in the river between East Boston and Charlestown, October to December (*Stimpson*). It is doubtless abundant elsewhere, as it is one of the most common species in northern seas, certainly on the European side, where it is usually found under stones between tide-marks.

Its very great variation in size and color, from dark olive or brown to flesh-color, with every variety of mottling, has given rise to many names for it. I had designated it under the name of *Eolis farinacea* (Plate XVIII. Figs. 257, 259, 263), on account of the mottling, as if with Indian meal, of the first specimens I examined. But the general and particular characters of form and habits, and the unique denticulation of the tongue, lead me to believe it identi-

* The figures prepared by Dr. Gould are not satisfactory. Through the kindness of Mr. Samuel Powel, of Newport, R. I., I am able to add Fig. 518, which correctly illustrates the denticles. — W. G. B.

cal with the Linnean species of Europe. Variations in the number of papillæ depending on age have also added to the confusion. It is sluggish in its movements, but very tenacious of life.

The eggs are excluded in a white, gelatinous, bobbin-like cord, which is intricately festooned and deposited upon stones in a spiral coil. (Plate XVIII. Fig. 258.) This and many other species, probably all, seem to deposit eggs both spring and autumn. Under the microscope they are very curious. At first the yolk, of which there are generally two or three in each egg, becomes partially divided into two, four, eight lobes, and so on till its surface looks like that of a blackberry; then it begins to move by the vibration of little fine hairs on the surface; at length the two wing-like lobes are developed, and the motion becomes very rapid. The mouth and stomach, as well as its contents, are distinctly visible. At this time it inhabits a little glossy shell shaped like a *Nautilus*, which it carries for a little time after it leaves the egg, but finally casts it off and floats away to undergo a still further change, such as described above.

The centre of each branchial papilla is filled with clusters of little glandular bodies considered to perform the office of the liver, among which the fluids of the stomach are forced by a churning motion. The papillæ are termed branchial because they are regarded as performing the function of lungs, though this office is doubtless performed by the action of the whole surface of the body.

Æolis salmonacea.

PLATE XVIII. FIGS. 264, 265.

Body broad and depressed, yellowish white; branchiæ subulate, salmon-colored, in crowded equidistant ranges; dorsal tentacles minutely serrated.

Eolis (*Cavolina*, Brug.) *salmonacea*, COUTHOUY, Bost. Journ. Nat. Hist. ii. 68, pl. 1, fig. 2.
Cavo'ina salmonacea, DE KAY, N. Y. Moll. 17, pl. 6, fig. 116 (1843).
Eolis salmonacea, GOULD, Inv. 6.
Æolis salmonacea, STIMPSON, Check Lists, 4 (1860).
Doris papillosa, FABR. teste MÖRCH.
Æolis Bodoensis, MÖLL., not GRUN. teste MÖRCH.

Body oblong, broad, tapering backwards to an acute point, translucent, yellowish-white; head large, lips tumid, mouth V-shaped; tentacles large and rather blunt, the dorsal ones minutely serrated at the sides. Branchiæ rather long, large, and pointed, deep sal-

mon-colored, a hundred or more arranged on each side in close-set, regularly spaced series, somewhat flattened and apparently perforate at tip. Foot broad, the anterior angles prolonged into tentacular appendages, the tail narrowing rather suddenly to an acute point. Length, one and three fourths inches; breadth, four fifths of an inch.

In Charles River, near Craigie's Bridge.

It is a true *Æolis*, of large size, its form much the same as that of *Æ. papillosa*, differing from it chiefly in its sharper and serrated tentacles, and in the color of the branchiæ. From *Æ. Mananensis* it differs not so much in color as in its more flattened body, more numerous and less clustered branchiæ.

SECTION 2. — *Flabellina.* Body slender; dorsal tentacles laminated; oral tentacles long. Branchiæ linear, clustered; angles of the foot much produced. Spawn of many undulated coils. Lingual plate with a strong central spine and marginal denticles, and two separate plain lateral spines.

Æolis Bostoniensis.

PLATE XIX. FIGS. 266, 273, 274, 275, 283.

Body elongated, lanceolate, delicate drab-color, with a silvery line on the tail and on the back of the anterior tentacles, which are long, subulate; posterior tentacles shorter, serrated at tips; branchiæ curved lanceolate, nucleus drab-colored, tips white, in four to six distant groups on each side; angles of foot much produced.

Eolis Bostoniensis, COUTHOUY, Journ. Bost. Soc. Nat. Hist. ii. 67, pl. 1, fig. 1. — GOULD, Inv. 6.
Æolis Bostoniensis, STIMPSON, Check Lists, 4 (1860).
Eolidia Bostoniensis, DE KAY, N. Y. Moll. 9, pl. 5, fig. 96 (1843).

Body regularly attenuated, rounded above, of a bluish or roseate tint, having a bright silvery line on the carina of the tail; the posterior face of the anterior tentacles is also often silvery. Branchiæ scymitar-shaped, nucleus drab or slightly russet, tips conical, silvery-white; they are arranged in five or more distant groups on each side, the anterior range having sixteen filaments arranged in cubic quincunx, the dorsal ones being longest, and in the succeeding groups they are fewer and shorter; these tufts curve backwards and inwards, forming arches over the back. Tentacles about equal in

length, subulate, their superior halves silvery, the dorsals delicately ringed alternately larger and smaller, serrate at the edges. Foot with the angles greatly protracted, tentaculiform, a muscular opaque band passing along the anterior edge from one to the other, looks like a portion wholly detached from the foot. Length, about one inch; breadth, three tenths of an inch.

Found in September, accompanied by ova, in Charles River, at the Bath-house, Craigie's Bridge. Rather common; in various parts of Boston Harbor by dredging, and at Lynn (*Stimpson*).

In size and general characters this species approaches closely to *Æ. coronata*, Forbes, differing mostly in coloration. I have regarded it as the *Æ. Bostoniensis*, though it will be seen, by comparison with the original description and figure, that there is a variance in many minor particulars; but as there is no incompatibility in essential characters, and as no other animal has been found in any way answering to Mr. Couthouy's description, it seems better to ascribe the differences to more accurate delineation and better opportunities for observation. Mr. Couthouy is doubtless in error in representing the tentaculiform dilatations of the angles of the foot as belonging to a separate piece, as this would be contrary to all analogy. The ova are expelled in a bobbin-like string, which is looped and festooned and attached to stones or logs in a loose coil. It is a very active and beautiful species. It feeds on zoöphytes.

Æolis rufibranchialis.

PLATE XIX. FIGS. 269, 272.

Body slender, tapering, white; oral and dorsal tentacles sub-equal; branchiæ nearly linear, variable in length, disposed in six or seven clusters on each side, interior of a bright vermilion, with an opaque-white rim near tip; anterior angles of foot prolonged and folded transversely.

Eolidia rufibranchialis, JOHNST. in Loud. Mag. Nat. Hist. v. 428; Ann. Nat. Hist. i. 121.
Eolidia Embletoni, JOHNST. in Loud. Mag. Nat. Hist. viii. 79.
Eolis rufibranchialis, ALDER and HANCOCK, Monog. Brit. Nudib., Fam. 3, pl. 14.
Eolis Mananensis, STIMPSON, Mar. Invert. Gr. Manan, 26 (1853).
Æolis Mananensis, STIMPSON, Check Lists, 4 (1860).

Body slender, tapering to a fine point, watery white with an opaque-white line along the middle of the back. Dorsal tentacles moderately long, tapering, wrinkled, the wrinkles varying in depth constantly, yellowish-white, sometimes tinted brownish, pale at tips and having an opaque-white line on the posterior face. Oral tenta-

cles about the size and form of the dorsals, though capable of contraction into a blunt knob, and with a central opaque-white line. Branchiæ slender, nearly linear, variable in length, disposed in six or seven clusters on each side, each cluster having from two to six rows of four papillæ each, interior a bright vermilion color with an opaque-white ring near tip. Foot narrow, transparent, the anterior angles prolonged and generally folded transversely. Usual length, one inch.

Found by Dr. Stimpson at Grand Manan, on a gravelly bottom, thirty-five fathoms; by Rev. T. A. Swan, in tide pools at Kennebunk, October.

Fig. 519.

Æ. Mananensis.

This common European species has at last been found on our shores, and an examination of the lingual denticles renders us quite certain of its specific identity. At first sight it would not be distinguished from *Æ. diversa*, but a comparison of the tentacles and angles of the foot gives most obvious differences. The description of *Æ. Mananensis* * scarcely differs in terms, as to quite variable features. Dr. Lovèn intimates that this is *D. branchialis*, Müller.

Æolis pilata.†

PLATE XIX. FIGS. 270, 277, 279, 281.

Body elongated, a carmine line margined with silvery dots between the tentacles and each tuft of branchiæ, tail silvery; tentacles subulate, simple, tipped with silvery, branchiæ clavate, contracted at tip, which has two silvery zones, nucleus pale chestnut, arranged in five or more distant groups of two transverse ranges.

Body elongated, rather narrow and gradually tapering to a point, arched above, of a pale drab color, margined above with light fawn color; along the back, beginning between the tentacles and between each tuft of tentacles, is an elongated stripe of carmine, margined

* I give Dr. Stimpson's description and a figure from one of his original drawings, — hardly considering Dr. Gould's opinion correct. — W. G. B.

E. mananensis, STIMPSON.

Body pale white, tentacles rather thick; dorsal ones brownish with pale tips, looking as if hollow, wrinkled; the oral blunt, curved, with a row of opaque-white specks along the outer edge; papillæ slender, irregular and variable in length, arranged in clusters along the sides of the back, of a bright vermilion color, with a ring of opaque white at the tips. Foot auricled, not very broad. Length, one and a half inches.

† All newly proposed specific names in this work are to be accredited to Dr. Gould.

W. G. B.

with silvery dots; tail silvery above and below; a russet line passes back from the base of the anterior tentacles to the first branchial tuft. Tentacles long, about equal, subulate, the terminal half silvery. Branchiæ rather stout, gradually enlarging, but suddenly contracted near tip, which is transparent, then an opaque-white zone, then a transparent zone, then another white ring where the branchiæ enlarges, so that when viewed at the apex we have an apparently open centre enclosed by a white ring, this by a transparent ring, and outside of all another white ring; granular nucleus varying between light brown and chestnut. They are arranged in five or more groups quite remote from each other. Each group is composed of two approximate transverse ranges; the first group is situated at some distance behind the tentacles, and has eight or ten cirri in each range, which decrease in length from above downwards; the next two tufts have six in a range, then five. Angles of the foot triangular, not much elongated. Length, an inch and a half; breadth, one fourth of an inch.

Found rather abundantly in September, in Charles River, on timbers. Dr. Stimpson found it spawning in October and also in June.

This animal has also a general resemblance to *E. coronata* and to *E. Bostoniensis* in form, size, and color, but has still a well-decided difference in the well-marked interrupted stripe on the back, the form and arrangement of the branchiæ, and the smooth posterior tentacles. The ova found with them were expelled in a bobbin-like string, which was looped and festooned and then attached in a loose coil to the timbers, or sometimes left at the surface of the water. These eggs, as well as those of other species, are beautiful objects to observe under the microscope. At first the yolk is seen to partially divide into halves, then into four, eight, sixteen, and so on, till the whole surface becomes granulated; then little fine hairs begin to appear and vibrate, and the yolk begins to revolve; then comes a mouth, stomach, and intestine and two eye-like points, which, however, are the little grains which constitute the ear (*otolithes*), and so on until the animal assumes a well defined, symmetrical form and very rapid motions. Some of these, which were laid September 27th, were watched in their development. October 6th a few were found to have escaped from the egg; on the next day about one half had become free and congregated at the surface. The little nautiloid shell, scarcely visible to the naked eye, was thinnest and purest crystal, and minutely decussated near the aperture. The stomach and intestine of the little embryo, and the movements of

their contents could be distinctly seen. Even on these a little parasite with a circular body and a large quadrate head, fringed around with vibrating cilia, was distinctly noticed. Another parasite was quite abundant upon the branchiæ, coursing up and down its sides rapidly, with ample room and verge enough. I have met with no notice of anything of the kind, nor have I seen any figure like it. The nearest approach is in *Encyc. Méth. pl.* 12, *fig.* 44–46 (*Trichoda præceps*). It adhered by a small fringed disk, attached to which by a short stem was an expansion somewhat like a Calla leaf, with long incurved fringes at the edges.

Æolis stellata.

PLATE XIX. FIGS. 271, 278.

Body slender, pale white; dorsal tentacles wrinkled transversely, long, but shorter than oral; branchiæ few, arranged in about five clusters on each side, those of second and third being longest, giving a star-like appearance to the animal when rolled up; foot strongly auricled in front.

Eolis stellata, STIMPSON, Mar. Inv. Gr. Manan, 25 (1853).
Æolis stellata, STIMPSON, Check Lists, 4 (1860).

"Body small, slender, elongated, pale white, pellucid; head with a flake-white patch above in front of the oral tentacles. Dorsal tentacles long, but shorter than the orals, slender, wrinkled transversely, especially in contraction. They arise very near together, and bear the prominent black eyes at their bases behind. Oral tentacles very long and slender, smooth and gracefully curved. Papillæ or branchiæ rather few in number, long and slender, arranged in about five clusters on each side, those in the second and third clusters being longest. Foot narrow, pointed behind, and strongly auricled in front. Colors: papillæ bright crimson, tipped with a ring of opaque white; tentacles pale pink near their bases, with their anterior halves white." (*Stimpson.*) Length, two fifths of an inch.

Found at Grand Manan, under stones at low-water mark.

Resembles somewhat *Æ. rufibranchialis*, Johnst., but its foot is not so long, nor its dorsal tentacles so tapering; and its papillæ are fewer and longer. When disturbed, it rolls itself up so that its branchiæ project in all directions like the rays of a star.

Æolis purpurea.

Eolis purpurea, STIMPSON, Mar. Invert. Gr. Manan, 25 (1853); Check Lists, 4 (1860).

Body large, full, robust; tentacles rather short, thick, smooth; the dorsal ones with the eyes far behind their bases. Papillæ large, flattened, crowded, arranged in five or six clusters on each side, leaving the middle third of the body bare. Foot broad, with short auricles in front. Mouth-disk large, triangular. Colors: body pale whitish, dark in the middle line from the viscera, showing through; papillæ dark purplish, with the tips covered with intense white specks. Length, one inch.

Found at Duck Island, under stones, at low water (*Stimpson*).

SECTION 3. — *Cavolina.* Branchiæ inflated; angles of foot rounded; spawn cup-formed.

Æolis picta.

PLATE XIX. FIG. 282.

Yellowish white, blotched with a brownish amber; oral tentacles short, stout; dorsal tentacles twice as long, simple, with an amber ring at outer third; branchiæ like an olive-jar, arranged in six or eight series; foot narrower than body, obtuse posteriorly, anterior angles rounded.

Eolis pallida, ALDER and HANCOCK, Ann. Nat. Hist. ix. 35.
Eolis picta, ALDER and HANCOCK, Monog. Nudib. Moll. Fam. 3, pl. 33 (1847).

Animal yellowish white, sparsely dotted with brownish amber blotches which occasionally coalesce, and a few opaque-white dots. Anterior tentacles quite short and stout; dorsals twice as long, simple, with an amber ring at the outer third. Branchiæ inflated, much like an olive-jar, somewhat compressed, with a very small interior darkish pith, the tip white, preceded by a ring of yellowish, and punctate as above described; they are arranged along each side in six or eight series, the anterior one being somewhat clustered and the remainder set upon oblique ridges, four or five on each, the upper ones large, those towards the abdomen growing gradually shorter and smaller. Foot clear, narrower than the body, rather shortened and obtuse posteriorly; anterior angles rounded. Length, one half to three fourths of an inch; breadth, one fourth the length.

Found in a timber dock in Boston, May, 1842; dredged in five

fathoms, near Governor's Island, Boston Harbor, June, 1850 (*Stimpson*).

This small, but beautiful species agrees so well with the English animal described by Alder and Hancock, that there can be but little hesitation in pronouncing them the same. The small size, inflated and brilliantly dotted branchiæ, unequal and annulate tentacles, and rounded angles of the foot are its principal characters. The dots on the back are aggregated into a somewhat zigzag stripe. The eggs are extruded in a ribbon, and attached in a coil by one edge.

" Æolis diversa.

PLATE XIX. FIGS. 267, 268, 276, 280.

Body lanceolate, acutely pointed, pale yellow; oral tentacles long and delicate; dorsal tentacles shorter, linear; branchiæ lanceolate, externally transparent and colorless, interior orange, thickly arranged along the sides in transverse series of three or four; foot with the angles slightly dilated.

Eolis diversa, COUTHOUY, Journ. Bost. Soc. Nat. Hist. ii. 187, pl. 4, fig. 14 (Feb. 1839). — GOULD, Inv. 6. — STIMPSON, Mar. Invert. Grand Manan, 26.
Eolidia diversa, DE KAY, N. Y. Moll. 9, pl. 5, fig. 97 (1843).
Æolis diversa, STIMPSON, Check Lists, 4 (1860).

Body long and slender, gradually tapering to a fine point, of a very pale straw color, tinted reddish by the viscera within; oral tentacles slender and long, of the same color as the body; dorsal tentacles shorter. Head rounded, pretty distinct from the body. Branchiæ slender at insertion, gradually dilating, and then narrowing to an obtuse point, externally clear and colorless, internally deep orange or lake red, arranged in a crowded, rather irregular manner along the sides in transverse series of three or four, the shortest nearest the foot. Foot colorless or slightly tinted by the reddish viscera, the interior angles moderately dilated. Length, an inch and a quarter; breadth, one third of an inch.

Found among roots of *Laminaria*, Chelsea Beach; Grand Manan (*Stimpson*).

Resembles in color *E. salmonacea*, but is much more slender, the angles of the foot less dilated, and the dorsal tentacles simple instead of serrated.

SECTION 4. — *Tergipes*, Cuv. Body slender. Tentacles simple, the oral pair very short. Branchiæ fusiform, inflated, set in single

series on each side of the back; foot narrow, anterior angles rounded. Spawn kidney-shaped. Tongue a single plate with a stout central spine and delicate marginal tentacles.

Æolis despecta.

PLATE XVI. FIGS. 222–225.

Animal colorless, with a zigzag olive-colored stripe along the back; branchiæ large, ovate, in a single series along each side; dorsal tentacles long; angles of foot not produced.

Eolis despecta, JOHNST. in Mag. Nat. Hist. viii. 378, fig. 35 *e*; Ann. Nat. Hist. i. 123. — ALDER and HANCOCK, Nudib. Moll. Fam. III. pl. 36.

Animal slender, tapering gradually backwards to a point, faintly greenish; on the back is a conspicuous olive-colored stripe which passes from side to side alternately to the bases of the papillæ; now and then the stripe passes from one papilla to another on the same side. Dorsal tentacles long, simple, rather blunt, stretching forwards, dotted along the lower two thirds and having an orange ring at that point; a roseate hue at their dorsal junction. Oral tentacles quite short, linear, pellucid. Branchial papillæ large, with a slender pedicle, and much dilated near tip, which is clear and transparent, in some aspects seeming as if encircled by a white ring; the central portion is filled with the granular hepatic substance of an olive-green, communicating with the zigzag vessel on the back; there are about four to seven on each side, alternating with each other. Foot narrow, anterior angles rounded. Length, about one fourth of an inch; breadth, one twentieth of an inch.

Found in a timber dock, Charles River, September, 1842; at South Boston, July; on the piles of Warren Bridge, low tide, among *Campanularia*, June and July (*Stimpson*); Gloucester (*Mrs. Smith*); Scotland (*Johnston*).

This minute little species is easily recognized by the dark zigzag vessel along the back, communicating first this side and then the other with the interior of the branchial papillæ. These are large, attached by a small pedicle, scattered along each side in a single range. Their colors vary slightly, being more or less pale. The ova are deposited in a small kidney-shaped mass upon zoöphytes. The lingual ribbon is composed of a single series of trefoil pieces having a median hooked point and about six lateral denticles.

Æolis gymnota.

PLATE XVI. FIGS. 238–241.

Animal small, tapering to a fine point, watery white; tentacles short, the posterior pair minutely serrated; branchiæ in seven lateral clusters of about five each, slightly club-shaped, having a reddish-brown centre.

Eolis (*Tergipes*, Cuv.) *gymnota*, COUTHOUY, Bost. Journ. Nat. Hist. ii. 69, pl. 1, fig. 3.
Eolidia gymnota, DE KAY, N. Y. Moll. 10, pl. 5, fig. 97 (1843).
Æolis gymnota, STIMPSON, Check Lists, 4 (1860).

Body slender and tapering to a very fine point, of a pale, watery drab color; head small, rounded, with a distinct neck; mouth small; dorsal tentacles short, linear, truncated, with very fine wrinkles or serratures at the sides; oral tentacles rather longer, pointed. Foot transparent, as wide as the body, anterior angles rounded. Branchiæ short, slightly enlarged towards the tip, pale straw color, very transparent, enclosing the reddish-brown or umber-colored glandular body, which gives the general color to the whole; they are arranged in seven pairs of clusters of about five each, along the lateral margins, leaving a large portion of the back exposed, the second and third pairs rather longer than the others; the branchiæ are usually carried spreading outwards rather than folded over the back. Length, about an inch; breadth, one tenth of an inch.

Found in Charles River, near Craigie's Bridge, Boston; at Warren Bridge, about the roots of *Tubularia*, October and November, 1847 (*Couthouy*).

Fig. 520.

Ova of *Æ. gymnota*, Couthouy.

This species, which thus far seems to be rare, is nearly allied to *Æ. concinna*, Alder and Hancock. In that species the branchiæ are fusiform and white-tipped, and have a peculiar satin lustre. The dorsal tentacles are longer than the oral. It seems to be a sluggish species. The ova are deposited about the roots of *Tubularia* in vermiform masses; four or five bunches are laid by an individual. They are laid in November.

Genus CALLIOPÆA, D'ORBIGNY. 1837.

HEAD without tentacles; labial feelers very long and tapering. Gills pyriform, placed in longitudinal lines. Front of foot angular.

Calliopæa (?) fuscata.*

PLATE XVI. FIGS. 218–221.

Animal semi-cylindrical, attenuated behind, dark slate-colored; head not distinct, excavated in front, tentacles two, long, pointed; branchiæ long, club-shaped, slender at base, alternating in two parallel rows on the two posterior thirds of each side, the lower series much the smaller; foot bi-lobed in front, contracted posteriorly.

Animal semi-cylindrical, gradually attenuated behind, dark slate-colored above, nearly black, punctured, an area running backwards from each tentacle, and the posterior aspect of the tentacles drab, near the posterior part of which area is the distinct black ocular spot; on the anterior face of the tentacles is a black line which passes down the outer margin of the face. Head not distinct from the body, a little excavated in front, and capable of protrusion considerably beyond the foot. Tentacles two, near the vertex, long and pointed. Branchiæ long, club-shaped, quite slender at base, black, white at tip and insertion; an upper row of four on each side begins about one third down the body, growing shorter towards the tail, and a lower series of five or six very much smaller ones arranged alternately with the upper ones. Foot pale ochreous, bi-lobed in front, contracted posteriorly. Length, three tenths of an inch; breadth, one thirtieth of an inch.

Found on logs in a mast-yard, Boston, July 22, 1842.

This curious little animal bears no resemblance to any other in the books, except *Calliopæa bellula*, D'Orbigny, which has a broader form, more robust and equal-sized branchiæ, which begin directly behind the ocular spots, and are covered with large dots or tubercles. It is even doubtful if they belong to the same genus, as D'Orbigny describes *Calliopæa* as having no tentacles, but two very long buccal appendages. In our species the tentacles or vibracula are distinctly upon the head, and could not be mistaken for labial prolongations. The white area enclosing the eyes and tentacles, in both instances, is a remarkable coincidence, and one is inclined to think that D'Orbigny's animal was not well observed as to the want of tentacles, and perhaps as to the part of the body occupied by the branchiæ, and that the two animals belong to the same genus and perhaps to the same species. The transparent tip of the branchiæ gives the branchiæ the appearance in certain lights of being hollow. The motions of the animal are remarkably rapid, as well as the manner in which the branchiæ are tossed in all directions. The ova are deposited in little oval clusters.

* See second note to page 243.

Genus EMBLETONIA, Alder and Hancock. 1851.

Tentacles two, linear, dorsal; the oral pair flattened into two lateral lobes. Branchiæ few, fusiform, set generally in single series down the sides of the back. Tongue a single plate bearing a central spine and lateral denticles. Jaws corneous.

Embletonia fuscata.

Plate XVI. Figs. 229–232.

Animal sub-cylindrical, narrowing backwards; tail short, pointed; drab-colored; head larger than body, broad, angles rounded, slightly emarginate; tentacles short; branchiæ club-shaped, arranged in five or six tufts on each side of the posterior portion of the body; angles of foot not dilated.

Animal minute, sub-cylindrical, narrowing backwards, tail short and pointed. Color varying from pale drab with a few dusky points to a smutty slate-color, made so by being completely covered by the dusky points; sometimes only the edges of the foot are dusky, and again there are blotches made up of aggregated dots, and on the whole the color may be called dusky. Head large, somewhat broader than the body, angles rounded, convex in front, or slightly emarginate. Tentacles short, linear, dotted, capable of corrugation. Branchial papillæ club-shaped, arcuate, dusky, tipped with light gray, arranged in five or six tufts on each side, the two or three anterior tufts containing three, and the others two papillæ of very unequal size; the first tuft is quite remote from the head. Foot slate-colored, as wide as the body, angles not dilated. Length, three twentieths of an inch; breadth, one fortieth of an inch.

Found in Charles River on logs in timber docks, and at South Boston Bridge, on *Laomedea geniculata*, July, 1842 and 1865; in Charles River, October (*Stimpson*).

This curious genus has been recognized but a short time, and was first set apart (1844) by Alder and Hancock, under the name of *Pterochilus;* but as this name had been applied to a genus of insects, they substituted the name *Embletonia.* The species are all quite minute, and only three have been hitherto noticed, all of which seem quite different from those observed here. But as the species are evidently subject to wide variation in color, size, and number of branchiæ, the identity or number of species must be yet uncertain. This species was found in great numbers on the long, floating tufts

of *Laomedea geniculata* in the latter part of July, surrounded by numerous clusters of ova. On visiting the locality a few days afterwards the polype had died, and all the mollusks had disappeared with them. This zoöphyte seems to be their proper habitat. The ova were deposited in small kidney-shaped masses. The plates of the lingual ribbon are quite short, slightly curved anteriorly, with a prominent central point and three lateral denticles each side.

Some specimens which resemble this species in form of the papillæ, and the following species in coloration, I had indicated under the name of *E. lanceolata*, on account of its broad anterior tapering backwards and ending in a delicate point extending some distance beyond the papillæ. It is thus described: —

Fig. 521.

E. lanceolata.

Animal minute, cylindrical, light straw color, sparsely dotted silvery. Head hooded, twice as wide as the body, slightly emarginate in front and angular at the sides. Tentacles conical, slightly spreading at base, truncated at tip, watery white. Branchiæ in five tufts, two in each tuft, the lower one shorter, arising very near and under each other, usually curved, irregularly silver-dotted (or greenish), very slender at base.

The variations are evidently so numerous, and the specimens for comparison thus far so few, that I prefer to notice it as a variety.

Embletonia remigata.*

PLATE XVI. FIGS. 214–217.

Animal long, slender, uniform pale yellow; head large, emarginate, angles dilated into triangular lobes with blunt points; tentacles long, linear; branchiæ removed from head, arranged on each side in distant tufts, the last pair at extremity of tail.

Animal uniform pale yellow, the branchiæ wax-yellow, being dotted with greenish and having a pale olive centre. Body long, slender, cylindrical anteriorly, gradually contracted backwards. Head large, emarginate in front, the angles dilated into triangular lobes, with concave sides and blunt point. Tentacles long and linear, gently curved. Branchiæ long, very slightly dilated, arranged on each side in distant tufts, the first one placed at about the anterior fourth of the animal and containing three papillæ originating close beneath each other, the lowest being much the shortest. The number in large specimens is 3, 3, 3, 2, 2, 2, 1, the last pair being at the extremity of the tail causes it to appear bifurcate. Foot as

* See second note to p. 243.

wide as the body. Eye spots distinct behind and a little inside of the tentacles. Length, one fourth of an inch; breadth, one twentieth of an inch.

Found in Charles River and at South Boston Bridge, with *E. fuscata*, in July, upon *Laomedea geniculata*.

Well-developed specimens seem quite remote from the last species on account of size, color, length, and form of papillæ, and number of tufts. But they are found in company; and there are specimens of *E. fuscata*, with only here and there a cluster or a line of dusky dots which would lead to the suspicion that they might blend with each other.

Family HERMÆIDÆ.

Body elongated, not provided with a distinct mantle. Mouth unarmed, or with corneous jaws; tentacles sometimes wanting; when present two, dorsal, non-retractile. Gills papillose. Vent usually central, on the posterior half of the back. Genital orifice at the right side.

The dorsal position of the vent, and the indistinct mantle distinguish this family from the *Elysiidæ;* perhaps those genera with horny jaws belong to a distinct family.

Genus HERMÆA, Lovèn. 1844.

Body elongated, attenuated, without a mantle. Head terminal. Tentacles two, longitudinally folded; jaws none. Branchiæ long, swelled, arranged at the sides of the back. Anus on the body in front of the heart.

Hermæa cruciata.

Plate XVII. Fig. 256.

Hermæa cruciata, Alex. Agassiz, MS.

Body very slender, the tail much attenuated. Foot narrower than the body, obtusely dilated at the anterior angles. Head small, semicircular. Mouth inferior. Tentacles dilated and obtusely pointed, the superior face longer than the inferior. Branchiæ dilated, shaped much like trefoil or the ace of clubs, the biliary organs within having a rude cruciate form; there are seven principal ones on each side and eight or ten intermediate much smaller ones. Length, — ?

Found by Mr. Alexander Agassiz at Naushon Island, September, 1863.

This is the only specimen of the genus yet found in American waters. The description is drawn from an enlarged sketch of the inferior face by Mr. Agassiz, no dimensions or colors being given. Indeed, the tentacles are so imperfectly given as to render its place in this genus a little doubtful. Its peculiarities leave no doubt as to its being hitherto undescribed. The branchial organs are slender at their insertion and curiously dilated at the middle, as well as the internal dark biliary contents representing a quaquaversal cross. These are supplied by two lateral longitudinal vessels instead of by a single dorsal one, as in most other *Nudibranchs*.

Genus ALDERIA, Allman. 1844.

Body ovate-oblong, without a cloak. Head terminal, distinct, produced on either side into a lateral lobe. Tentacles none. Maxillæ none. Branchiæ papillose, along each side of the back. Anus posterior, on the median line of the back. Genital orifice anterior, on the right side.

Alderia Harvardiensis.

Plate XVI. Figs. 226-228.

Animal broad lanceolate, ochreous brown; foot yellow; lateral prolongations of head tentacular; branchiæ short, curved, enlarging towards tip, in about six clusters of two each, on either side, of which the lower one is much smaller.

Canthopsis Harvardiensis, Agassiz, Proc. Bost. Soc. Nat. Hist. iii. 191 (1850), no description. — Stimpson, Mar. Invert. Gr. Manan, 25 (1853).

Animal small, about three times as long as broad, square in front, broad lanceolate behind, and somewhat acuminated at point, a little contracted at sides. Color of body ochreous brown, of the foot ochreous yellow. The body is square or a little concave in front, the lateral extensions of the head triangular, but capable of considerable extension so as to resemble short tentacles; a little contracted behind the head, and back a little excavated, but sides generally parallel, abruptly narrowing behind and terminating by a nipple-like vent. Branchiæ short, slender at origin, enlarging and quite blunt at tips, somewhat curved, arranged two and two along each side, beginning at some distance from head, in six or seven clusters, the

lower papilla very much smaller than the upper. Foot twice as broad as the body, so that by rolling the margins upward the branchiæ are partly covered, broad lanceolate, anterior angles a little dilated, and tip acuminated; some arborescent vessels appear above. Length, about half an inch; breadth, one third as much.

Found in great numbers, in brackish water, at Cambridge, April, 1848 (*Agassiz*); very common in sheltered muddy bays, feeding on filamentous chlorosperms, Grand Manan (*Stimpson*).

Only one species of this curious genus (*A. modesta*, Lovèn) has been described, which differs from ours more especially in the branchiæ, which are much longer and grow longer towards the tail, more uniform and slender, more numerous, having three or four in each range, and seven or eight ranges. The coloration is much paler. The European species seems to have similar habits, being found in "shallow pools of salt or brackish water, on a muddy bottom," sometimes crawling entirely out of water. As remarked by Lovèn, it has the branchiæ of *Æolis*, the vent of *Doris*, and the head and foot of *Akera*.

Family ELYSIIDÆ.

Body limaciform, clothed with cilia. Tongue narrow; teeth in a single, central series. Tentacles subulate or linear, folded; eyes sessile, near the bases of the tentacles. Gills in the form of plaits or vessels, radiating on the surface of the back. Vent central, dorsal, on the hinder part of the back.

In this family the respiratory function appears to be performed by the entire surface of the body, special organs for that purpose being almost obsolete.

Genus ELYSIA, Risso. 1812.

Body with the lateral ridges dilated into wing-like natatory appendages. Head distinct, with two conspicuous auriform tentacles.

Elysia chlorotica.

Plate XVII. Figs. 251–255.

Animal emerald green, dotted with white and red spots; slender, tapering behind, with broad, lateral expansions, folded and overlapping each other on the back when the animal is in motion; tentacles two, lanceolate, folded beneath;

head distinct, obtuse, slightly emarginate; anterior angles of foot widely produced, triangular.

Actæon ——, Agassiz, Proc. Bost. Soc. Nat. Hist. iii. 191 (1850).
Actæon chloroticus, Agassiz, in MSS.

Animal emerald green, finely dotted with opaque white interspersed with red specks. Body slender, tapering backwards, with very broad lateral expansions or wings, which, when folded as they are when the animal is crawling, overlap each other on the back in a roof-like manner, and the whole animal has then a lance-shaped form generally acutely pointed behind, but in some attitudes obtuse; when expanded, they have a broad ovate form, like a leaf with the border more or less undulating, and this resemblance is further carried out by the vein-like folds or canals which ramify on its surface from the heart which forms a globular or bulbous eminence in front; the expansion begins at the anterior part of this bulb. In front of this is a well-marked neck and head, on which latter are two delicately lanceolate tentacles, which are furrowed or folded beneath. The eyes are placed a little behind the tentacles. The head is obtuse and slightly emarginate. The organs of generation are just behind the right tentacle, and the male organ is very often protruded, of about the same form and nearly as large as the tentacle. The anterior angles of the foot are widely produced, of a recurved triangular form, as if another pair of tentacles. Length, about one inch, sometimes an inch and a half; breadth, when folded, about one fifth the length, and height equal to breadth, when fully expanded, equal to three fourths the length.

Found in great numbers in brackish water, on the Cambridge marshes, in the spring of 1848 (*Agassiz*).

Genus PLACOBRANCHUS, Van Hasselt. 1824.

Body with two large, semi-circular, membranous expansions, crossing on the back and forming a canal open at both ends. Tentacles club-shaped, lobed at the end.

Placobranchus catulus.

Plate XVII. Figs. 249, 250.

Animal sea-green with whitish spots; body ovate-lanceolate; lateral expansions two thirds its length, not meeting when reflected over the back; head large, rounded, globose; tentacles short, blunt, broad; foot wide as body, square in front, pointed behind.

Placobranchus ——, AGASSIZ, Proc. Bost. Soc. Nat. Hist. iii. 19 (1850).
Placobranchus catulus, AGASSIZ, MSS.
? *Placobranchus simplex*, GIRARD, Proc. Bost. Soc. Nat. Hist. v. 89.(1854), no description.*

Animal of a brownish sea-green color, with a whitish spot between the tentacles, another running obliquely inwards and backwards from the outer base of each tentacle half-way to the median line, a small one at the tip of the alar expansion, and a larger one near the margin of the expansion near its middle; foot much paler, yellowish green. Body ovate lanceolate, the lateral expansions about two thirds its length and not quite meeting when reflected upon the back. Head large, rounded in front, globose. Tentacles short, broad, blunt, like cats' ears, so that the whole has a curious resemblance to the head of a kitten when viewed from above. Along the back, as far as covered by the expansions, are fine longitudinal folds. Foot nearly as wide as the body, squared in front, obtusely pointed behind. Length, one fourth of an inch; breadth, one tenth of an inch.

Found in the channel near East Boston, January, 1848 (*Agassiz*).

FAMILY LIMAPONTIIDÆ.

BODY depressed. Tongue narrow; teeth in a single central series. Tentacles none, or simple, contractile. Gills none external.

In this group of slug-like forms the branchial appendages are altogether absent, or represented only by simple lobes or ridges on the sides of the body; the tentacles are linear, and not longitudinally folded as in *Elysiidæ*, and the body is depressed. In the genus *Rhodope* of Kölliker the Molluscan type appears to be at the lowest stage of development, and to represent the *Planariæ* among the *Annelids*.

Genus LIMAPONTIA, FORBES. 1832.

BODY depressed without lateral ridges. Head elevated at the sides into crestlike ridges; eyes large, sessile on the back of the head, in the centre of pale circular spaces. Mantle distinct.

* About a quarter of an inch long, rather stout, blunt anteriorly, and tapering posteriorly, of a deep greenish hue (*Girard*).

Limapontia zonata.

Niobe zonata, GIRARD, Proc. Bost. Soc. Nat. Hist. iv. 211 (1852).
Limapontia zonata, STIMPSON, Check Lists, 4 (1860), no description.

Less than a line in length, its body and head not quite so much separated as in *L. limacina*. It has a pale reddish hue, with transverse bands of white, which have suggested the specific name of *zonata*. Boston Harbor (*Girard*).

Sub-Class PROSOBRANCHIATA.*

GILLS pectinate or plumose, placed in a mantle-cavity above the neck, or under the mantle on the left side. Heart situated behind the gills. Sexes distinct. Abdomen well developed, usually spiral and protected by a shell. Adult and larva shell-bearing; larva furnished with deciduous ciliated fins springing from the sides of the head.

FAMILY CHITONIDÆ, GUILDING.

SHELL not spiral, shield-shaped, composed of numerous pieces; aperture very large.

Genus CHITON, LIN. 1758.

SHELL oval, consisting of eight arched pieces, arranged across the body of the animal in a series overlapping each other, their ends set in the skin which forms a rim around them.

Chiton apiculatus.

FIG. 20.

Dorsal triangles with series of elevated points; lateral triangles with scattered, elevated dots.

Chiton apiculatus, SAY, Amer. Conch. No. 7; BINNEY's ed. 231. — SOWERBY, Conch. Ill. 140. — DE KAY, N. Y. Moll. 164, pl. 10, figs. 201, 202. — STIMPSON, Check Lists, 4 (1860).

* This portion of the work was not completely arranged for the press by Dr. Gould. I have worked it up from his interleaved copy of the first edition, containing his rough notes of corrections, additions, references, &c.
The classification is that adopted by Dr. Gould. — W. G. B.

Shell oval-oblong, convex, sub-carinated; color grayish or light-chestnut; valves eight; anterior valve crescentic, with three or four concentric lines, and numerous separate, elevated, equal, sub-equidistant dots, arranged somewhat in regular lines along the margin; the six following valves have, on their dorsal triangles, from twenty to thirty longitudinal series of elevated points, like beads, somewhat converging towards the summit; on the lateral triangles, which are distinctly elevated above the dorsal triangles, are scattered points like those on the anterior valve; posterior valve with the series of dots like the dorsal triangles, a central tubercle, and the remainder with scattered dots like those on the anterior valve. Margin coriaceous, with alternate stripes of white and dusky pubescence. Length, one inch; breadth, three fifths of an inch.

Fig. 522.

C. apiculatus.

Inhabits the southeastern waters of this State, after passing Cape Cod. I have received it from Nantucket and Martha's Vineyard. It is found more abundantly along the coast of New York and New Jersey. Dr. Jay found it in great numbers at Gardiner's Island. South Carolina (*Ravenel, Say*).

This species, so accurately described by Mr. Say from a single specimen sent him by Dr. Ravenel of Charleston, South Carolina, cannot be confounded with any other. The beautiful and conspicuous bead-like series of dots are not found on any other described species, though they partially and inconspicuously appear on *C. cinereus*. On account of their arrangement, I had formerly indicated the shell under the name of *C. pectinatus*. The recent publication of Mr. Say's manuscript has established his name. The lines of dots are not all of equal length, and sometimes they become so blended as to form merely an elevated line, but they are generally very definite. I have seen some British shells labelled *C. ruber*, which have precisely the same sculpture; but they are much more elegant in marking, and are of a bright reddish brown or rose color. They cannot be *C. ruber*, however, according to any description I have seen under that name.

Chiton cinereus.

Fig. 22.

Shell ovate, the valves carinated across the middle, and pointed behind; of a dead cinereous or greenish color, and minutely shagreened; margin pulverulent.

Chiton marginatus, PENNANT, Brit. Zool. iv. 61, t. 36, fig. 2. — LIN.; GMÉLIN, Syst. 3206, No. 26. — MONTAGU, Test. Brit. 1. — PULTENEY, Dorset Catal. 25, pl. 1, fig. 2. — MATON and RACKETT, Lin. Trans. viii. 21, pl. 1, fig. 2. — WOOD, Gen. Conch. 21, pl. 3, fig. 4. — SCHROET. Einl. in Conch. iii. 508. — D'ARGENV. Conchyl. t. 25, fig. M. — LAM. An. sans Vert. vii. 492. — SOWERBY, Conch. Illust. figs. 106–112. — FLEMING, Edin. Encyc. vi. 102; Brit. Anim. 289. — GOULD, Inv. 147, fig. 22.

Chiton cinereus, LIN. Syst. Nat. 12th ed. p. 1107. — LOWE, Zool. Journ. ii. 99, pl. 5, fig. 5. — FORBES and HANLEY, Brit. Moll. ii. 402. — STIMPSON, Check Lists, 4 (1860).

Shell small, ovate, moderately convex, with an elevated ridge along the centre, where each of the valves projects backwards in a minute beak, ending at the centre of the posterior valve; valves faintly divided into triangles; surface otherwise apparently smooth, but under the magnifier it is found to be beautifully shagreened, the granules being arranged in diamonds on every part. Color a dead, dull ashen or greenish color, sometimes mottled. Margin narrow, membranous, coated with a dusty pigment, which is alternately hoary and brownish. Length, half an inch; breadth, three tenths of an inch.

A single specimen of this shell was found living, a few years since, by Dr. Charles Pickering, at Phillips's Beach, and is now in the Cabinet of the Academy of Natural Sciences at Philadelphia. It is a common British species.

It is an inelegant shell at first sight, its dingy, dull surface presenting nothing attractive. But no one can fail to admire its beautiful sculpture when viewed under the magnifier. The serrated, reflected margin usually mentioned in descriptions, is merely a contraction of the margin about the ends of the valves, such as we see in many other species.

It is allied to *C. apiculatus;* but we find the lateral triangles as much sculptured as the dorsal in this; the dots are diamond-shaped, and arranged in quincunx, and not bead-like, and arranged in series. From our other species it is distinguished by its dead surface.

Chiton ruber.

FIG. 24.

Shell small, oval, elevated, carinated; valves marked by lines of growth; otherwise smooth, strongly beaked; margin pulverulent, red and white.

Chiton ruber, LOWE, Zool. Journ. ii. 101, pl. 5, fig. 2. — SOWERBY, Conch. Illust. figs. 103, 104, lower fig. — FLEMING, Edin. Encyc. vi. 102; Brit. Anim. 289. — DE KAY, N. Y. Moll. 165. — STIMPSON, Check Lists, 4 (1860).

Shell small, strong, nearly oval, being but slightly narrowed before, convexly elevated and traversed by an elevated ridge or keel along the back; valves without any appearance of granulations or punctures under the magnifier, but marked with conspicuous grooves, indicating the stages of growth, most marked near the border; otherwise perfectly smooth, shining, and polished; posterior margin strongly beaked. Color, light brick-red or flesh-color, with occasional dashes of dark crimson across one or more valves, sometimes arranged in stripes; such a stripe will usually be found at a little distance on each side of the keel, while the keel itself has a stripe of crimson spots, occasionally replaced by a yellow spot. It is frequently incrusted with a black foreign substance. Margin coriaceous, coated with a red and white dust arranged in alternate stripes. Triangular areas generally well marked. Interior bright rose-red, becoming fainter at the margins of the valves. Length, half an inch; breadth, three tenths of an inch.

Fig. 523.

C. ruber.

Found adhering to stones dragged from the deep by kelp; also in the maws of fishes. Eastport (*Cooper*); on stones, Halifax Harbor (*Willis*); Greenland (*Möller*); Cape Cod, northward (*Stimpson*); Connecticut (*Linsley*).

It is not difficult to distinguish at sight well-marked individuals of this species from those of *C. fulminatus*. But there are intermediate specimens which it is not easy to pronounce upon. In general, this species is smaller, more solid, more convex, the valves more beaked, lines of growth more deep, the zigzag lines never appearing, though the posterior margin of the valve is sometimes dotted with white and red. The impunctured or ungranulated surface, however, is the best, as it is a constant characteristic.

That this is the *C. ruber* of Lowe and Sowerby I think there can be no question, though it may not be *C. ruber* of other authors. The figure in Pennant, "Brit. Zool.," pl. 36, fig. 3, also represents accurately most of the adult specimens, though it is quoted by authors as *C. lævis*, which is distinguished by its finely reticulated margin.

Chiton marmoreus.

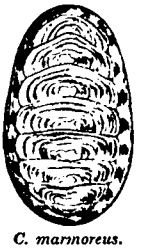
Shell ovate-oblong, brownish or yellowish red, variegated with angular, whitish lines, and a series of whitish points along the posterior margin of the valves; surface minutely granulated; margin pubescent.

Chiton marmoreus, O. FABRICIUS, &c.; STIMPSON, Check Lists, 4.
Chiton lævigatus, FLEMING, &c.

Chiton fulminatus, COUTHOUY, Am. Journ. Sc., o. s. xxxiv. 217 (1838); Bost. Journ. Nat. Hist. ii. 80, pl. 3, fig. 19.—DE KAY, N. Y. Moll. 165, pl. 10, fig. 199.—GOULD, Inv. 1st ed. 148.

Shell oblong-ovate, rather flat; color varying from bright red to yellowish or dark reddish brown, with numerous, fine, zigzag, whitish lines arranged over the whole surface, and a line of six or eight whitish spots alternating with dark red along the posterior edge of each valve; valves carinated and slightly beaked, their surface covered with microscopic granulations arranged in quincunx; to the naked eye smooth and shining; division into triangular areas very indistinct; lines of growth very faint. Margin narrow, coriaceous, coated with a close, short down, alternately red and white. Within white at the edges of the valves, deepening towards the centre to a rose color. Length, seven tenths of an inch; breadth, nine twentieths of an inch.

Fig. 524.



C. marmoreus.

Found in the stomachs of fishes caught off Egg Rock, Cohasset, &c. Eastport (*Cooper*); Halifax Harbor, on stones (*Willis*); St. Anne's Gaspé (*Bell*); Cape Cod, northwards (*Stimpson*); Greenland (*Möller*); Grand Manan (*Stimpson*); Gaspé (*Dawson*); Connecticut (*Linsley*).

This very beautifully marked species varies considerably in outline, size, marking, and color. Some have the sides nearly parallel, and others are decidedly ovate; some exceed an inch in length; some have the lines of growth deeply marked, while others are nearly smooth; some have a dead, ashen color, but such are apparently very old. In some the zigzag lines and white dots are very distinct, in others not.

This may very probably prove identical with some species of the north of Europe; but as it is utterly impossible to say which one, I will not run the risk of adding further confusion to the already inextricable synonymy of the *Chitons*, by offering any conjectures. Dr. Lovèn says, "It is a very common species with us [in Sweden]. I think it is the *S. lævigatus*, Fleming." Mr. Sowerby thinks "it would be impossible to find a distinguishing character" between this and *C. cinereus*. In this he is certainly mistaken. It comes much nearer to his red variety of *C. marginatus;* but the granulations of the surface of our shell are not half so distinct as in either *C. marginatus* or *C. cinereus*. It is, therefore, best to use Mr. Couthouy's name for the present, as it is the only one to which the shell can now, or perhaps ever, be referred with certainty.*

* Now recognized as *C marmoreus*. — W. G. B.

Chiton albus.

FIG. 21.

Shell small, elliptical, valves carinated and partially beaked, minutely granulated; margin beaded.

Chiton albus, MONTAGU, Test. Brit. 4. — SOWERBY, Conch. Illust. 99, 99 *a*, 100. — BROWN, Conch. of Great Brit. &c. pl. 35, fig. 2. — GOULD, Inv. 1st ed. 150, fig. 21. — DE KAY, N. Y. Moll. 163, pl. 10, fig. 200. — STIMPSON, Check Lists, 4.
Chiton aselloides, LOWE, Zool. Journ. ii. 103, t. 5, fig. 3. — WOOD, Suppl. pl. 1, fig. 9.
Chiton sagrinatus, COUTHOUY, Am. Journ. Sc., o. s. xxxiv. 217 (1838); Bost. Journ. Nat. Hist. ii. 82.

Shell small, elongated-oval; covered with a bluish black pigment, which easily rubs off, and leaves the ground yellowish or ash colored; surface beautifully granulated, under the microscope, so as to resemble the finest shagreen. Valves moderately carinated, and with a minute beak; distinctly marked with lines of growth, and a feeble diagonal ridge often divides each side into two triangles; anterior valve crescentic, with about twelve marginal teeth. Margin membranous, yellowish, covered with beaded granules. Length, nine twentieths of an inch; breadth, five twentieths of an inch.

Fig. 525.

C. albus.

Found in the stomachs of fishes in considerable numbers. Isle of Shoals to Cape Cod (*Stimpson*); Eastport (*Cooper*); Halifax (*Willis*).

This shell was first discovered on this side the Atlantic by Mr. Joseph P. Couthouy, and supposed by him to be new. But it agrees in all respects with Mr. Lowe's figure and description of *C. aselloides;* and Mr. Sowerby, on an examination of our shell, accords with me in opinion that it is that shell. Mr. Lowe subsequently states (Zool. Journ. iii. 79) that his species "is clearly identified with *C. albus* of Montagu." But, as it is only white when divested of its pigment, the name *aselloides* is much more descriptive.

The ridges, edges, and interstices of the valves usually have the pigment worn off, so as to present a yellowish color. The beaded margin distinguishes it from all our other species; but it is rare to find the margin unimpaired.

Chiton mendicarius.

Shell elongate in its centre towards its margin, granulated longitudinally and irregularly; clouded; areas scarcely conspicuous; margin coriaceous, red.

Chiton mendicarius, MIGHELS and ADAMS, Bost. Journ. iv. 42, pl. 4, fig. 8 (1842); Proc. i. 49 (2841). — STIMPSON, Check Lists, 4.

Fig. 526.

C. mendicarius.

Shell cinereous, with dark clouds, long-oval with obtuse dorsal ridges, surface with elevated dots or granules, disposed in longitudinal lines, except towards the margin, where they are irregular and larger; no visible concentric striæ; triangular areas very indistinct, outer whorls small, margin coriaceous, red. Length, one inch; breadth, four inches; width of margin, six hundredths of an inch.

Casco Bay. This very distinct species was taken from the stomach of a haddock in June, 1841. Only a single specimen has been found, which is in the cabinet of J. W. Mighels. (*Mighels* and *Adams.*)

Grand Manan (*Stimpson*).

Genus AMICULA, Gray. 1842.

Mantle covered with scattered fascicles of hairs, and having two series of setigerous pores; gills posterior.

Shell with the valves externally scarcely conspicuous, the exposed parts small, sub-cordate, as broad as long.

Amicula Emersonii.

Fig. 19.

Shell ovate-oblong, white; valves reniform, each with a central cordiform, sculptured area, the remainder covered with a dirty membrane, with two rows of hairy tufts at the margin; anterior valve emarginate.

Chiton Emersonii, Couthouy, Sillim. Journ. o. s. xxxiv. 217 (1838); Bost. Journ. Nat. Hist. ii. 83, pl. 3, fig. 10 (1838). — De Kay, N. Y. Moll. 165, pl. 10, fig. 198.
Chiton vestitus, Sowerby, Zool. Journ. iv. 368; Conch. Ill. fig. 128.
Amicula Emersonii, Stimpson, Check Lists, 4.
Chiton Emersonianus, Gould, Inv. 151, fig. 19.

Shell ovate-oblong, broadest behind; of a light drab color; valves eight, kidney-shaped, the extremities being rounded and the posterior margin deeply arched; posterior valve narrowed and excavated at the tip; on the centre of each valve is a small, heart-shaped area, beautifully sculptured with bead-like granules, three or four series of which are parallel to its border, and the central ones on each side are arranged in a somewhat concentric manner; the beak is elevated and pointed, and smooth or slightly striated; the area on the anterior valve is shaped like the valve. The remaining portion

of the valves is smooth, with three radiating lines passing from the beaks to the middle of each base, enclosing two rounded, thread-like ribs. It is also covered with a thin membrane, coated with a dirty, scurfy epidermis which is easily rubbed off. Margin broad and thick, resembling macerated calf-skin, coated like the rest of the surface, and having two ranges of small tufts of yellowish hair, two on each of the intermediate, and six or eight around the terminal valves. Length, four fifths of an inch; breadth, six tenths of an inch.

Fig. 527.

A. Emersonii.

Found in stomachs of fishes taken in Massachusetts Bay. Bedford Basin, N. S., common (*Willis*); Cape Cod, northward (*Stimpson*); fossil, Montreal (*Dawson*).

This is a very curious shell, and, with three or four other described species, might constitute a sub-genus. It is so rough and unseemly that it is very likely to be rejected as some decayed specimen; or the discoverer would begin to clear off, as some extraneous substance, the coating which belongs to it, and gives it a character.

The shape of the valves, the sculptured areas, and the emarginate anterior valve, will not allow it to be confounded with any other species. Could it be presumed that so remarkable characters as the central areas and the anterior valve were overlooked, we might suppose this to be the *C. vestitus*, Broderip and Sowerby (Zool. Journ. iii. 368). The areas, however, are easily defaced, and might not have attracted notice in their specimens. In other respects their description would apply well to our shell. The figure recently given of it in the Appendix to Beechey's Voyage, tab. 41, fig. 14, represents a shell proportionally much narrower than ours.

Family DENTALIIDÆ.

Animal with the branchiæ in the form of numerous long filaments, arising from two radical lobes placed above the neck, and enveloped, with the head, by the mantle. Shell tubular, not spiral.

Genus **DENTALIUM**, Lin. 1740.

Shell tubular, elongated-conical, slightly curved, opening at each end by a rounded orifice, that of the apex entire, without fissure or emargination.

Dentalium dentale.

FIG. 5.

Shell polished, slightly curved, with eighteen or twenty faint, unequal ribs.

Dentalium dentalis, LIN. Syst. Nat. 1263. — BORN, Mus. t. 18, fig. 13. — MATON and RACKETT, Lin. Trans. viii. 237. — DESHAYES, Mem. de la Soc. d'Hist. Nat. ii. 353, pl. 16, figs. 9, 10. — LAM. An. sans Vert. v. 595. — DE KAY, N. Y. Moll. 160, pl. 10, fig. 197. — GOULD, Inv. 1st ed. 155, fig. 5.
Dentalium striatum, MONTAGU, Test. Brit. 495.
Dentalium attenuatum, SAY, Journ. Acad. Nat. Sc. iv. 154, pl. 8, fig. 3.
Dentalium occidentale, STIMPSON, Shells of New England, 28 (1851).

Shell slender and tapering, curved like an elephant's tusk, the tip cut off, leaving a very small opening. Surface rather glossy, yellowish white, marked with about twenty closely arranged, unequal, rib-like striæ, running the whole length of the shell. Length, about an inch; diameter at the larger end, about one eighth of an inch.

I am enabled to add this shell to our list through the kindness of my friend W. W. Wheildon, of Charlestown, who sent me the specimens, accompanied by the following memoranda: —

Two specimens of *Dentalium* were taken from the stomachs of codfish, in the spring of 1839. They were both found to have penetrated the entrail of the fish, and were firmly fixed there. They had probably been in the fish for some length of time. Both specimens were unfortunately eroded, one of them so much so that it is quite impossible to determine any of its characters, except its size, its markings being entirely obliterated. In the other specimen the striæ are distinct, and seem to conform to the *D. dentalis* of the coast of England. Twenty to twenty-two striæ may be counted on its surface."

Eastport, ten to twenty fathoms (*Cooper*); deep water, on the coast of Maine and Massachusetts Bay (*Stimpson*).

Genus ENTALIS, SOWERBY. 1842.

DIFFERS from *Dentalium* by having the perforation at the apex with a notch-like fissure on the dorsal or posterior margin.

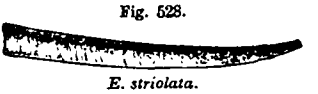
Entalis striolata.

Entalis striolata, STIMPSON, Proc. Bost. Soc. iv. 114 (1851); Check Lists, 4.
Dentalium entalis, MICHELS not LIN.

This species I obtained in great numbers by dredging in from ten to sixty fathoms on muddy bottoms at the mouth of the Bay of

Fundy. It is that referred to as *D. entale* by Dr. Mighels. Having had the opportunity of comparing numerous specimens of the European species with ours, I am convinced they are distinct. It differs from *D. Tarentinum* in being larger, tapering more gradually to a point, in being more rugose with the lines of growth and in being almost always destitute of longitudinal striæ.

Fig. 528.



E. striolata.

The length of one specimen is an inch and one half; the diameter at the aperture, one hundred and seventy-five thousandths of an inch. Imperfect specimens indicate a length of two inches. (*Stimpson.*)

Family PATELLIDÆ, D'Orb.

Shell depressed, conical or cap-shaped; aperture wide, with a crescentic, muscular impression, interrupted in the region of the head.

Genus TECTURA, Aud. and Milne-Ed. 1830.

Shell basin-shaped, apex obtuse, usually more depressed and thinner than *Patella*, and distinguished from it chiefly by its inhabitant.

Tectura testudinalis.

Fig. 12.

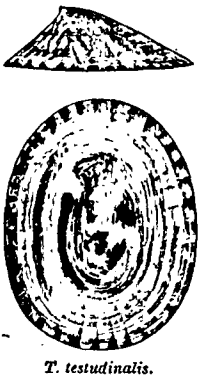
Shell oblong-oval, greenish white, for the most part with brownish sub-dividing radiations; centre within, dark brown.

Patella testudinalis, Müller, Prodr. p. 237. — Fabr. Fauna Grœnl. 385. — Lam. An. sans Vert. vii. 543. — Dillwyn, Catal. 1045. — Wood, Catal. No. 63, pl. 37.
Patella testudinaria, Kaemerer, Rudolst. Conch. 12, pl. 2, figs. 4, 5.
Patella testudinaria Grœnlandica, Chemn. Conch. x. 325, pl. 168, figs. 1614, 1615.
Patella tessellata, Muller, Zool. Dan. Prodr. iii. 2868; Z. D. t. 12, figs. 6–8.
Patella Clealandi, Sowerby, Records of Lin. Soc. viii. 621. — Fleming, Brit. Anim. 287.
Patella virginea, Müller, Prodr. iii. 2867; Zool. Dan. t. 12, figs. 4, 5.
Patella virginea? Gmélin, 3711. — Dillwyn, Catal. 1052.
Patella amœna, Say, Journ. Acad. Nat. Sc. ii. 223 (June, 1822); ed. Binney, 73.
Patelloidea amœna, Couthouy, Bost. Journ. Nat. Hist. ii. 171.
Patelloida testudinalis, Lea, Trans. Amer. Phil. Soc. (New Series), vii. 73. — De Kay, N. Y. Moll. 162, pl. 9, fig. 196.
Patella clypeus, Brown, Conch. of Great Brit. &c. pl. 37, figs. 9, 10.

Lottia Antillarum, SOWERBY, Conchol. Manual, fig. 231.
Lottia testudinalis, GOULD, Inv. 1st ed. 153, fig. 12.
Tectura testudinalis, STIMPSON, Check Lists, 4.

Shell oblong-oval, moderately elevated, thin, apex behind the middle, pointed, and turning forwards; surface finely checkered with minute radiating lines crossed by encircling lines; general color a greenish white, with dark brown stripes radiating from the summit, and frequently dividing, before they reach the margin, which is sharp and entire; within, the central portion is dark brown, and the margin is more or less bordered or checkered with the same color, by the exterior markings showing through. Ordinary length, four fifths of an inch; breadth, thirteen twentieths of an inch; height, one fourth of an inch.

Fig. 529.



T. testudinalis.

Found along our whole coast, adhering to the rocks, and is common on the northernmost shores of Europe and America. Gull Island (*Smith*).

This shell varies infinitely in its markings. The general appearance is as above described. Sometimes all exterior coloring is wanting; and commonly, the lines are so delicate, and arranged in such a manner as to exhibit a kind of network. The largest specimens I have seen were brought from Castine, Maine. These were one and one fourth inches in length. There can no longer be any doubt that this is the shell long known in the north of Europe as *P. testudinalis*. Specimens sent me from Ireland, Scotland, and Norway agree in every particular with ours. Probably the *P. Antillarum* is the same, though Mr. Sowerby does not intimate this in his correspondence.

Mr. Couthouy was the first to determine the generic place of this shell, by an inspection of the animal.

I have employed the generic term *Lottia*, of Gray, as it has the right of priority, is not an objectionable derivative, and is in general use among all conchologists except the French. *Patelloidea* was also given, as the name of a family, by Blainville. The arrangement of the branchiæ of the animal would, strictly, remove the genus from this family.

[The name *Tectura* has precedence.

Tectura alveus.

FIG. 13.

Shell oblong-oval, compressed at the sides, thin, colored with a network of white and brown.

Patella alveus, CONRAD, Journ. Acad. Nat. Sc. vi. 267, pl. 11, fig. 20 (1831).
Patelloidea alveus, COUTHOUY, Bost. Journ. Nat. Hist. ii. 177. — DE KAY, N. Y. Moll. 162, pl. 9, fig. 194.
Lottia alveus, GOULD, Inv. 1st ed. 154, fig. 13.
Tectura alveus, STIMPSON, Check Lists, 4.

Shell small, thin, and fragile, elevated, compressed at the sides, so that the margins are nearly parallel, the ends of equal breadth, and obtusely rounded; apex at the posterior third, pointing forwards; outer surface beautifully checked with the lines of growth, and fine, but distinct, radiating lines; color a reddish brown, with oval or circular yellowish white spots, arranged in a somewhat regular manner, so that the whole resembles a network. The thinness of the shell allows the external coloring to appear on the inside; edge entire. Length, five tenths of an inch; breadth, three tenths of an inch.

Fig. 530.

T. alveus.

Found abundantly on the eel-grass (*Zostera marina*), to whose narrow leaves its form is exactly adapted. Whole coast of New England (*Stimpson*).

In old specimens a lateral compression is very obvious, and the sides are at least parallel, and sometimes incurved for one half the length of the shell. The apex, when not worn off, is acute, and projects distinctly forwards. The markings usually give the shell a checkered appearance; but occasionally we have stripes, as in the preceding species.

This shell is the very miniature of *Patella compressa*. Mr. Sowerby suggests that it bears the same relation to *P. testudinalis* as *Patella compressa* does to *P. miniata;* in other words, it is the same species, changed in form from having adhered to a narrow sea-weed instead of a stone. The general marking of the shell, and the circumstance of its seldom, if ever, being noticed living anywhere except upon the narrow leaves before mentioned, render this opinion not at all improbable.

Genus LEPETA, Gray. 1840.

Shell obovate, depressly conical, surface with radiating striæ; apex eccentric, posterior; aperture oval, muscular impression horse-shoe-shaped, open anteriorly. Animal blind.

Lepeta cæca.

Shell small, white, with numerous diverging ribs, checked by revolving lines, apex central.

Lepeta cæca (*Patella*), Müller, &c.; Stimpson, Check Lists, 4.
Patella candida, Couthouy, Sillim. Journ. o. s. xxxiv. 217 (1838); Bost. Journ. Nat. Hist. ii. 86, pl. 3, fig. 17. — Gould, Inv. 1st ed. 152. — De Kay, N. Y. Moll. 61.
Pilidium candidum, Stimpson, Shells of New England, 29.

Shell small, conical, white, oval, having numerous minute radiating ribs, traversed by equally fine concentric lines, which give the surface, when viewed under a magnifier, the appearance of network; summit nearly central, margin slightly scalloped by the termination of the ribs; interior white. Length, seven twentieths of an inch; height, one tenth of an inch; breadth, one fifth of an inch.

Fig. 531.

C. cæca.

Only three specimens of this shell are yet known. The first one found was taken by Mr. Couthouy from the stomach of a fish caught off Barnstable, and was described by him. A second has since been found by Mr. W. W. Whieldon, of Charlestown. It is at once distinguished by its checkered or granulated surface, no other species, yet described, having that character.

Greenland (*Möller*).

Family CALYPTRÆIDÆ, Brod.

Shell basin-shaped, serving as a cover to the animal; distinguished from the preceding family by the branchiæ being situated in a peculiar cavity upon the back.

Genus CREPIDULA, Lam. 1799.

Shell oval, arched, somewhat boat-shaped, with an imperfect spire pressed against the margin; cavity partially divided within by a horizontal partition.

Crepidula fornicata.

FIG. 17.

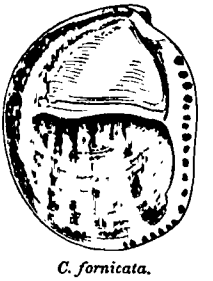
Shell oval, apex turned to one side, and terminating in the margin; partition appressed to one side.

Patella fornicata, LIN. Syst. Nat. 1257. — MARTINI, Conch. i. 160, t. 13, figs. 129, 130. — LISTER, Conch. t. 545, figs. 33, 35. — KNORR, Vergn. vi. t. 21, fig. 3.

Crepidula fornicata, LAM. An. sans Vert. vii. 641. — SAY, Journ. Acad. Nat. Sc. ii. 225 (July, 1822); ed. BINNEY, 73. — DE KAY, N. Y. Moll. 157, pl. 7, figs. 152, 154. — STIMPSON, Check Lists, 4.

Shell obliquely-oval, one side more oblique than the other, apex a little prominent, turned to one side, not separate from the body of the shell, and generally united with the margin of the aperture; convexity moderate, but varying according to the object on which it is seated; surface wrinkled by the lines of growth, of a dirty white color, and figured with interrupted, waved, longitudinal lines, of a light chestnut color, and covered with a yellowish epidermis; aperture obliquely sub-oval, the edge entire and sharp, color light brown, with darker dots and blotches; a ray from the apex along the middle of the shell generally lighter than the rest; diaphragm white, occupying about one half the aperture, one side of it defined by a distinct line, the other, for a considerable space, compressed against the side of the shell, and firmly united to it, the free edge waving, one half advancing considerably beyond the other, and leaving a conspicuous notch at the side, outside the boundary line, surface in general concave, but a narrow, arched portion traverses the middle. Length, one and one half inches; breadth, one and one fifth inches.

Fig. 532.



C. fornicata.

Found adhering to other shells and to each other.

This is probably, what Mr. Say supposed it to be, a variety of *C. fornicata*, as originally described, and is a species found in various seas. It is found occasionally thrown upon the beaches near Boston after a storm, but is not uncommon about Cape Cod, and the islands to the southeastward. The best specimens I have seen were brought on oysters from Prince Edward's Island, off the mouth of the St. Lawrence. Its shape varies according to the body on which it rests. Four or five of different ages are frequently found riding upon each other. When growing upon *Pecten irradians* it is found to have

ribs corresponding to those of the *Pecten*. It is a solid shell, and the diaphragm is situated near the mouth, leaving no cavity extending under the beak. The manner in which one edge is pressed against the side of the shell is quite characteristic. The margin of the aperture is generally white, dotted with chestnut; the remainder of the interior is more or less brown. Sometimes the attachment of the diaphragm is bordered with reddish brown.

Whole coast of New England (*Stimpson*); St. Simon's Isle, Ga. (*Cooper*); mouth of Rio Grande (*Schott*).

Crepidula plana.

FIG. 16.

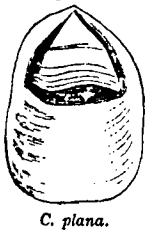
Shell ovate, flat, white; apex acute, terminal; diaphragm convex.

Crepidula plana, SAY, Journ. Acad. Nat. Sc. ii. 226 (1822); Amer. Conch. pl. 44; ed. BINNEY, 74. — GOULD, Inv. 1st ed. 159, fig. 16. — DE KAY, N. Y. Moll. 158, pl. 7, fig. 153.

Crepidula unguiformis, STIMPSON, Check Lists, 4.

Shell ovate, flat, or as often a little concave or convex, thin, transparent, white, wrinkled with concentric lines of growth; apex minute, pointed, turning a little to one side, and constituting the extreme termination of the shell; the other extremity broader, and regularly rounded; interior white, of a brilliant polish, and irridescent; diaphragm less than half the length of the shell, convex, rising to a level with the margin, free edge for the most part straight, but having a projecting angle near one side. Length, one and one fourth inches; breadth, nine tenths of an inch.

Fig. 533.



C. plana.

Found in the aperture of other shells.

This species has also been observed through a wide region. Mr. Say noted it as far south as Florida. It does not, however, frequent localities north of us. It is still regarded by some as a variety of the *C. fornicata* modified by its position. But the peculiarity of form, coloration, diaphragm, and habit of living seem to render it sufficiently distinct. When young, it is of a more rounded form, but becomes elongated by age. It is otherwise very variable in shape, conforming to the position it occupies in the throat of some other shell.

This is very likely to prove to be the *C. unguiformis*, Lam. (*Patella crepidula*, Lin.) In this opinion I have the concurrence of Mr.

Sowerby. Deshayes observes that he can hardly think that the shell figured as *Calyptræa unguiformis* by Broderip, in "Trans. Zool. Soc." i. pl. 29, fig. 4, is the shell of Linnæus. He says the shell of Linnæus is distinguished by a profound notch at one extremity of the partition, and a feebler one at the other; that the shell described by Mr. Say as *Crepidula plana* wants this notch, and is the shell figured by Broderip. Now it so happens, that the only specimen which I am certain is entire has this notch precisely as described, and the tooth-like process which separates the large notch from the rest of the margin is such as would be likely to be broken in almost every instance. This fact leads me to suppose, that all three of the shells in question are of the same species, and should be called *C. unguiformis*. If so, its habitat is as wide as that of *C. fornicata*. But as I have not yet the means of confirming my supposition, I give Mr. Say's name.*

Whole Atlantic coast of the United States.

Crepidula convexa.

FIG. 15.

Shell elevated, apex terminal, separated from the body of the shell; diaphragm convex, less than half the aperture, edge simple.

Crepidula convexa, SAY, Journ. Acad. Nat. Sc. ii. 227 (1822); ed. BINNEY, 75. — GOULD, Inv. 1st ed. 160, fig. 15. — DE KAY, N. Y. Moll. 158, pl. 7, fig. 131. — STIMPSON, Check Lists, 4.

Shell small, opaque, very convex, obliquely-ovate, one side nearly vertical, the other sloping; surface wrinkled, color ashen-brown, with bands, stripes, or dots of dark reddish-brown; apex acute, separate from the body of the shell, turning very little to one side, and downwards as far as the tip of the shell; within shining, of a uniform dark reddish-brown color; aperture oval; diaphragm deeply situated, leaving a cavity extending into the beak, convex, brown, the free edge white and simply curved. Length, nine twentieths of an inch; breadth, six twentieths of an inch; height, four twentieths of an inch.

Fig. 534.

C. convexa.

Found on sea-weed, and on stones among the roots of sea-weed. Massachusetts Bay, southward (*Stimpson*); Sable Island (*Willis*).

It is seldom found entire. Mr. Say described from dead shells, and had not seen its true colors. In most instances one side is

* It is now acknowledged to be the *unguiformis*. — W. G. B.

nearly upright, while the other is sloping; but sometimes the two sides are nearly similar. The diaphragm is regularly arched, the arch terminating at a regularly curved, depressed line, on one side, and here the free edge makes a slight projection.

This shell is easily distinguished from all our other species by its convexity and by the color of its deeply seated diaphragm.

[Animal black, except bottom of foot, which is gray of various shades, edged with dark; tentacles white, edged with black; lobes of mantle white; tentacles short, blunt, but capable of elongation and tapering; eyes black, on the exterior sides of the tentacles, near their bases.

Crepidula glauca.

Fig. 14.

Shell oval, smooth, apex separate, slightly turned to one side; diaphragm less than half the length of the shell, edge waved.

Crepidula glauca, Say, Journ. Acad. Nat. Sc. ii. 226 (1822); ed. Binney, 72. — Gould, Inv. 1st ed. 151, fig. 14. — De Kay, N. Y. Moll. 159.

Shell obliquely oval, thin, moderately convex, of a glaucous or grayish-green color, faintly freckled with dots of darker and lighter color; surface nearly smooth; the apex is pointed, projecting considerably beyond the outline of the aperture, and, turning downwards and a little to one side, does not quite reach the plane of the aperture; aperture rounded oval, the margin usually expanded; interior a uniform, dark reddish-brown, or occasionally mottled; the edge is margined with yellowish-white, and dotted with brown; diaphragm white, running within the beak so as to exhibit a considerable recess; it is waved, two thirds being convex, and the remainder concave; the free margin has a concave curve in proportion as the diaphragm is arched. Length, eleven twentieths of an inch; breadth, nine twentieths of an inch; height, one tenth of an inch.

Fig. 535.

C. glauca.

I have taken only one specimen of this shell, which I found on a stone dragged upon Chelsea Beach by a *Laminaria* attached to it. It is, however, common on the ocean shore of Rhode Island, and is doubtless to be found at the Elizabeth Islands, and along the South Shore. The specimens I have received from Colonel Totten have a peculiar figure, and from their undulated edges I should conjecture they were taken from off the *Pecten irradians*, which is found abundantly about Cape Cod.

It is readily distinguished from *C. convexa* by its depressed and broader figure, and white diaphragm. From small specimens of *C. fornicata* it is distinguished by its projecting and central apex, and by the constant recess under the beak. In some specimens the arching of the diaphragm is greater than in others, and then its free margin is more or less curved also. There is no decided notch at either extremity.

Vineyard Sound (*Desor*); Nova Scotia (*Willis*).

[Considered by Dr. Stimpson as a synonyme of *C. fornicata*.

Genus CRUCIBULUM, Schumacher. 1817.

Shell sub-conic; apex sub-central; aperture wide, with the internal appendage entire and cup-shaped, attached by one of its sides.

Crucibulum striatum.

Calyptræa (*Dispotæa*) *striata*, Say, Journ. Phila. A. N. S V 216, 1826; ed. Binney, 124. — Stimpson, Shells of New England, 30. — De Kay, N. Y. Moll. 155, pl. 7, fig. 155. *Crucibulum striatum*, Stimpson, Check Lists, 4.

Fig. 536.

C. striatum.

Shell oval, prominently convex, with numerous slightly elevated, equal, equidistant radiating lines; summit glabrous, wax-yellow, sub-acute, inclining toward the left side and the posterior end; inner valve patelliform, dilated, attached by one side to the shorter side of the shell; acutely angulated at the anterior line of junction, and rounded behind, and rapidly attenuated to an acute tip, which nearly corresponds with the inner apex of the shell. Length, less than nine tenths of an inch. (*Say.*)

Whole coast of New England (*Stimpson*); New Jersey (*Say*).

Family FISSURELLIDÆ, Risso.

Shell in the adult conical, symmetrical, not spiral, either pierced at the apex, or more or less grooved or fissured anteriorly; aperture wide, not pearly within; muscular impression crescentic, open in front.

Genus CEMORIA, Leach. 1820.

Shell small, like *Patella*, with the apex elevated and curved forwards, and with a fissure just behind the apex.

Cemoria Noachina.

FIG. 18.

Shell small, white, conical, covered with unequal, radiating ribs; apex curved forwards, and perforated obliquely backwards.

Patella Noachina, LIN. Mantissa, 551. — CHEMN. Conch. xi. 186, pl. 197, figs. 1927, 1928.
Patella apertura, MONTAGU, Test. Brit. 491, pl. 13, fig. 10. — WOOD, Index, pl. 38, fig. 89.
Patella fissurella, MÜLLER, Zool. Dan. i. t. 24, figs. 4–6. — GMÉLIN, Syst. 3728, No. 193.
Fissurella Noachina, LYELL, Obs. sur le Soulèvement de la Suède, No. 16, pl. 2, figs. 13, 14. — LAM. An. sans Vert. vii. 604. — SOWERBY, Conch. Illustr. (*Fissurella*), fig. 15.
Puncturella Noachina, LOWE, Zool. Journ. iii. 77.
Cemoria Flemingii, LEACH; SOWERBY, Conch. Man. fig. 244.
Sipho striata, BROWN, Conch. of Great Brit. &c. pl. 36, figs. 14–16.
Diodora Noachina, STIMPSON, Shells of New England, 30.
Cemoria Noachina, GOULD, Inv. 1st ed. 156, fig. 18. — STIMPSON, Check Lists, 4.
Cemoria princeps, MIGHELS and ADAMS, Bost. Journ. iv. 42, pl. 4, fig. 3.

Shell bluish-white, conical, its summit pointed and turned backwards, and the surface covered with about twenty-two ribs, with intervening smaller ones, and wrinkled by the lines of growth. A narrow, diamond-shaped slit is presented at the summit, which opens in the interior by a circular aperture, towards the margin, the course of this canal being as it were arched over by a thin plate of the shell, when viewed within; edge oval and scalloped by the ribs. Length, one fifth of an inch; breadth, one eighth of an inch; height, one tenth of an inch.

Fig 537.

C. Noachina.

This curious little shell, the only recent species of its genus known, is frequently taken from the stomachs of fishes. It is also an inhabitant of the northern seas of Europe, and is found in a fossil state also.

Cape Cod, northward (*Stimpson*).

It has been arranged under different genera, but undoubtedly has claims to be the type of a distinct genus. Besides those mentioned above, the genus *Rimula* of Defrance, would also probably embrace it. But *Cemoria* has the priority over all those which have been constructed, though any one of the others would seem to have been better chosen names. Lowe remarks, that the *P. apertura* of Montagu has been ascertained, almost beyond a doubt, to be nothing more than the young of *Fissurella Græca*. But his figure represents this shell.

Family JANTHINIDÆ.

Shell thin, translucent, spiral, more or less turbinate, with a sinistral nucleus.

Genus JANTHINA, Lam. 1801.

Shell sub-globose, thin, fragile, spire short; aperture angular at the anterior junction of the inner and outer lips; pillar twisted; lip thin, with a sinus at the middle.

Janthina fragilis.

Shell thin, brittle, conical, ventricose, violaceous beneath, whiter on the spire.

Helix janthina, Lin.; Gmélin, Syst. 3645, No. 103. — Lister, Conch. t. 572, fig. 24. — Rumphius, Mus. t. 20, fig. 2. — Gualt. Test. t. 64, fig. O. — Sloane, Jamaica, t. 1, fig. 4. — Brown, Jamaica, t. 39, fig. 2. — D'Argenv. Conch. pl. 6, fig. 5. — Chemn. Conch. v. t 166, figs. 1577, 1578. — Wood, Index, pl. 34, t. 116.

Janthina fragilis, Desh Encyc. Méth. iii. 324, pl. 456, fig. 1; Ann. du Mus. xi. 123 (animal). — Blainv. Malacol. pl. 37 bis. fig. 1 *a*. — Sowerby, Conch. Man. fig. 333. — De Kay, N. Y. Moll. 125, pl. 36, fig. 360. — Stimpson, Check Lists, 4.

Janthina communis, Lam. An. sans Vert. 1st ed. vi. 206; 2d ed. ix. 4. Lister, 572, fig. 23.

Shell globose-conic, thin, brittle, transparent; whorls three or four, forming a short spire, the last one very large and angular at the middle; beneath the angle the color is deep violet, lighter about the axis, and above it the color is merely tinted with violet, a little darker at the suture; surface shining, wrinkled by the lines of growth, and with short, oblique wrinkles above the angle of the last whorl, and marked with revolving lines beneath that angle; aperture large, semi-oval, outer lip very thin, retiring as it passes the angle of the whorl, so as to produce a shallow recess; inner lip cylindrical, straight, corresponding with the axis of the shell. Length, eight tenths of an inch; breadth, one inch.

The *Janthina* floats, by means of a mass of vesicles, at the surface, throughout the wide ocean, and is not unfrequently driven upon the ocean shores by storms. After a severe gale, in the autumn of 1839, great numbers of them were collected on the shores of Nantucket, some specimens of which were furnished me by T. A. Greene, Esq., of New Bedford. Sable Island. fragment (*Willis*).

Family TROCHIDÆ.

Shell turreted or conoid; aperture rounded or oblong, not spreading; lips disunited posteriorly.

Genus ADEORBIS, Searles Wood. 1842.

Shell depressly conical, orbicular, deeply umbilicated; whorls few, not nacreous, flattened, smooth or striated, the last more or less angulated at the periphery; aperture transversely oval, peristome interrupted; inner lip sinuated, outer lip arcuate, simple, acute.

Adeorbis costulata.

Margarita costulata, Möller, Ind. Moll. Gr. 8.
Adeorbis costulata, Stimpson, Proc. Bost. Soc. iv. 14 (1851); Shells of New England, 32; Check Lists, 4.

It is minute, about one tenth of an inch in diameter, white, somewhat thick and rugged near the apex, the sculpture appearing to advantage only on the thinner and more delicate outer whorl, which is convex, rounded, and covered with prominent, crowded ribs. On the side of the whorl many of these ribs divide into two, thus occupying the increased space; and beneath, the ribs flow into each other and gradually disappear without interrupting the five distant, elevated, spiral striæ on the umbilical half of the base. The umbilicus is deep. The aperture is rounded, with the peristome continuous. The operculum is multispiral, of about eight volutions, of which the outermost are testaceous, presenting a frosted appearance; the central volutions, occupying about one fourth of the diameter, are corneous. In deep water off Cape Ann, Grand Manan (*W. Stimpson*).

Fig. 538.

A. costulata.

Genus MARGARITA, Leach. 1819.

Shell conical, moderately elevated; whorls few, sub-inflated; aperture rounded, imperfect posteriorly; lip sharp; umbilicus deep; operculum multi-spiral; the nucleus central.

Margarita cinerea.

Shell low-conical, thin, ash colored, umbilicated, with four to six elevated and numerous smaller revolving ridges, and regular, eroded, elevated lines of growth.

Turbo cinereus, COUTHOUY, Bost. Journ. Nat. Hist. ii. 99, pl. 3, fig. 9.
Trochus costalis, LOVÈN, in letters.
Margarita cinerea, GOULD, Inv. 1st ed. 252. — DE KAY, N. Y. Moll. 108, pl. 6, fig. 113. — STIMPSON, Check Lists, 4.
Margarita striata, BRODERIP and SOWERBY.
Margarita sordida, HANCOCK.

Shell small, thin, of a low conical or pyramidal shape; color a dull ashy-white, sometimes tinted with green; whorls five to seven, convex, and rendered angular by prominent, irregularly disposed revolving ridges, of which from four to six are more elevated, with less conspicuous intervening ones; and the lowest of these elevated ridges forms a limit, at which the whorl slopes abruptly, and presents a broad, slightly convex base, marked with fine, equal, and equidistant revolving lines; the whole surface is also covered with crowded, very fine, and distinctly prominent lines of growth; the umbilicus is broad and deep, and bounded by the last revolving line, which forms an angle terminating at the most anterior point of the otherwise circular aperture, and here causes an angular prolongation; outer lip regularly curved, sharp, finely scalloped; it rises on the left margin, and terminates just behind the umbilicus, slightly expanding and partially covering it; a very thin stratum of enamel sometimes extends across the body of the shell; throat within with lines corresponding to the external marking; operculum circular, multi-spiral. Height, four fifths of an inch; base a little less.

Fig. 539.

M. cinerea.

Found in a very fresh and beautiful condition, but rather rare as yet, in the stomachs of fishes caught in Massachusetts Bay. Grand Manan to Cape Cod (*Stimpson*); Halifax (*Willis*); N. W. of Greenland (*Hayes*); St. Anne, &c. (*Bell*).

It is distinguished by the beautiful, sharp lines of growth, which are not interrupted by the spiral ridges, and by these ridges covering all the base; also, by the slight projecting angle of the aperture. It is very closely allied to *M. striata*, Broderip and Sowerby, "Zool. Journ." iv. 371, and figured in Sowerby's "Conch. Illust." (*Margarita*), fig. 3. By the kindness of Mr. Sowerby, however, I have been enabled to compare the two. In *M. striata* the whorls are not angulated by the revolving lines, the largest of which are

not larger than those on the base of our shell, while its base is nearly smooth; its umbilicus is much smaller. In color, size, and general shape, the shells are alike.

Margarita minutissima.

Shell very minute, sub-ovately globose; whorls three, convex, longitudinally furrowed; spire short, obtuse; suture strongly impressed; aperture orbicular, umbilicus large, deep.

Margarita minutissima, MIGHELS, Bost. Journ. iv. 349, pl. 16, fig. 5 (1843). — STIMPSON, Check Lists, 4.

Shell very minute, sub-discoidal, globular-ovate, of a dull ash color; whorls three, convex, with distinct longitudinal, approximate sulci, running obliquely, and disappearing as they approach the umbilical region; spire very low and obtuse at the apex; suture deep, aperture circular; lip sharp and nearly continuous posteriorly; umbilicus large and profound. Length, about one fifth of an inch; breadth, about equal to the length.

Fig. 540.

M. minutissima.

Casco Bay.

I have never found but a single specimen of this shell, which I took from the stomach of a haddock. It is not very nearly allied to any of the other species found on the coast. Under a magnifier, it somewhat resembles *M. varicosa*, Nob., in the ultimate whorl. It is, however, readily distinguished by its very depressed and obtuse spire (*Mighels*).

Margarita undulata.

FIG. 172*.

Shell orbicular, low-conical, dark flesh-color, encircled with regularly disposed spiral lines, alternately larger and smaller, coarsely plaited at the sutures.

Margarita undulata, SOWERBY, Malacol. and Conchol. Mag. i. 26; Conchol. Illust. (*Margarita*), fig. 4. — GOULD, Inv. 1st ed. 254, fig. 172*. — DE KAY, N. Y. Moll. 109. — STIMPSON, Check Lists, 4.
Margarita striata, var. *Grœnlandica*, MÖLLER, Ind. Moll. Gr.
Turbo incarnatus, COUTHOUY, Bost. Journ. Nat. Hist. ii. 98, pl. 3, fig. 13.
Trochus tumidus, MONTAGU, Leth. Suev. pl. 30, fig. 3.

Shell thin, orbicular, depressed-conical, usually of a bright brownish-red color; sometimes rose-red, at others pale flesh-colored; whorls four, convex, somewhat flattened above, undulated near the suture by short folds or wrinkles, and encircled by numerous, elevated,

smooth spiral lines at uniform distances, and for the most part alternately larger and smaller; base considerably flattened, of a lighter color, and with finer striæ; umbilicus broad, funnel-shaped, distinctly bounded by a spiral line, and partially covered by the reflected inner lip; aperture nearly circular, very oblique; lip sharp, slightly jagged; throat pearly, with greenish and golden reflections; operculum thin, horny, multi-spiral. Height, three tenths of an inch; base, four tenths of an inch.

Fig. 541.

M. undulata.

Found in great numbers in the stomachs of fishes, and also alive on Phillips's Beach. Mr. Sowerby received it from the Arctic Ocean. Halifax (*Willis*); Eastport (*Cooper*); Cape Cod, northward (*Stimpson*).

This beautiful shell cannot be mistaken for any other species on the American Atlantic coast. Its color, its regular spiral lines, undulated sutural region, and pearly aperture render it a very beautiful shell, having more of the aspect of a tropical than of a northern shell. Mr. Sowerby's description and figure were *published* in the same month in which Mr. Couthouy *read* his description to the Boston Society of Natural History; and we must, therefore, allow his name the right of priority.

There is considerable variety in the coloring; the freshest young shells are of a rose-red, and of a more depressed form; the majority are of a brownish-red; the undulations are seldom, but sometimes wanting.

Margarita helicina.

Fig. 173*.

Shell orbicular, depressed, smooth and shining, translucent, of a light horn color, with very fine revolving lines on the base; aperture circular.

Margarita arctica, Leach, in Ross's Voyage of Discovery, 8vo. 1819; Appendix. — Sowerby, Malacol. and Conchol. Mag. part i. 25; Conchol. Illust. (*Margarita*), fig. 6. — Gould, Inv. 1st ed. 255, fig. 173*. — De Kay, N. Y. Moll. 108, pl. 6, fig. 107.
Margarita helicoides, Beck, MS.
Turbo inflatus, Totten, Sillim. Journ. xxvi. 368, figs. 5, *a*, *b*, *c*.
Paludina inflata, Menke.
Turbo helicinus, O. Fabricius.
Margarita helicina, Stimpson, Check Lists, 4.

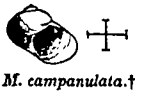
Shell small, orbicular, depressed, thin, and translucent, smooth and shining, of a light yellowish horn color or light olive; whorls four or five, very convex, the last very large and tumid, a little flat-

tened above; minutely wrinkled by the lines of growth, and at its base marked with very fine spiral lines; suture well impressed; aperture large, circular, somewhat expanded; edge sharp and simple, a little reflected at the umbilicus, which is large and profound, not bounded by an angular ridge; operculum horny, multi-spiral. Length, one fifth of an inch; breadth, nearly three tenths of an inch.

Fig. 542.

M. helicina.

Fig. 543.



M. campanulata.†

Found abundantly on all our sandy beaches. In some seasons, however, I have looked for them almost in vain. Their proper habitat is the deep sea, as they are thrown up alive, on the large leaves of *Laminaria*. They were received by Leach and Beck from Greenland, Baffin's Bay, and the Arctic Seas. I have obtained them of a much larger size than is given by any other observer.

It is a very pretty shell, generally iridescent, or reflecting a metallic, bronze lustre. It has more the aspect of a land or fresh-water shell than that of a sea-shell. It is not likely to be confounded with any other species except the following.

I have given this species as the *M. arctica*, Leach, in accordance with the opinion of Mr. Sowerby, who compared our shells with the authentic specimens in the British Museum.

I must confess, also, that in comparing the descriptions of *M. vulgaris* and *M. arctica* in the "Malac. and Conch. Magazine," and specimens of *M. vulgaris*, sent me by Mr. Sowerby with small specimens of the above-described shell, I can perceive no essential distinction, excepting in size; the first is said to be palish, the second olivaceous.

[It is now referred to the *Turbo helicinus* of Fabricius.

Margarita argentata.

Fig. 174*.

Shell depressed, conical, of a pearly-white color, covered with microscopic, revolving lines; umbilicated.

Margarita argentata, Gould, Inv. 1st ed. 256, fig. 174*. — Stimpson, Check Lists, 4.

Shell minute, conical, with an obtuse tip, of a dead pearly-white color; composed of four convex whorls, the last of which is very

† Fig. 543 represents the allied species *M. campanulata*, Morse, usually confounded with *M. arctica*. It appears not to have been recognized by Dr. Gould. — W. G. B.

slightly angular; the next above is elevated, but the uppermost, and frequently the two uppermost, are not elevated above the succeeding whorl, so that the apex is obtuse; everywhere covered with crowded and very fine revolving lines; suture deep; aperture circular; lip sharp, simple; interior pearly and iridescent; umbilicus moderately large. Length, one tenth of an inch; breadth, one eighth of an inch.

Fig. 544.

M. argentata.

Found in fishes caught off Cape Ann and Cohasset, in considerable numbers. Fishing Banks (*Willis*); Grand Manan to Cape Cod (*Stimpson*).

It is the smallest of the species of this genus that we find. It is most obviously distinguished from small specimens of the last species by its dead surface, which may well be compared to chased silver; and, on a more intimate examination, it is found to have more uniform and decided revolving lines, and its spire is more elevated.

I was at first disposed to regard it as the *M. carnea*, Lowe (Zool. Journ. ii. 107, pl. 5, figs. 12, 13, 132). But, in the following essential characters belonging to that, it differs from our shell, viz., an acutely pointed spire, an angular aperture, and a uniform yellowish flesh-color. The revolving lines, too, are said to be elevated and sub-distant, terms which allow of much latitude of meaning, but which we should not be likely to apply to the crowded, microscopic lines on our shell. They appear quite conspicuous on the figure quoted. The young of *M. undulata* would answer better to that description. If it is not *M. carnea*, it has not been described; Mr. Sowerby hesitates to call it so.

Margarita obscura.

Fig. 171*.

Shell depressed-conical, solid; spire obscure, reddish-brown, base ash-colored; whorls angulated by two or three revolving ridges; lines of growth coarse; aperture circular, pearly within.

Turbo obscurus, Couthouy, Bost. Journ. Nat. Hist. ii. 100, pl. 3, fig. 2.
Margarita obscura, Gould, Inv. 1st ed. 253, fig. 171*. — Stimpson, Check Lists, 4.

Shell small, solid, orbicular, low-conical, of a dull reddish-brown above, and of a light ash color at base; whorls five, convex, and rendered angular about the middle by a prominent revolving ridge; on the lower whorl are often one or two less conspicuous ridges,

and numerous very fine lines; on the base these are so faint as to be usually imperceptible without a magnifier; these, with rather coarse lines of growth, somewhat prominent at intervals, often produce an indented or cellular appearance on the surface; umbilicus large and deep, bounded by a sharp, angular ridge; aperture circular; lip simple and sharp; within iridescent; operculum horny, multi-spiral. Height, five tenths of an inch; diameter of base, seven twentieths of an inch.

Fig. 545.

M. obscura.

Found rather plentifully in fishes caught off Nahant. All of New England coast (*Stimpson*); Fishing Banks (*Willis*).

It has a general resemblance to *M. cinerea*, but it is more solid, less elevated, less angular, revolving lines fewer and less elevated, the base smoother, the aperture more simple and circular, and the color very different.

It may perhaps be identical with *M. costellata*, Sowerby, described in the "Malacological and Conchological Journal," No. 1, and figured in his "Conchological Illustrations" (*Margarita*), fig. 15. On inspection, Mr. Sowerby, though not having his shell at hand for comparison, regards it as distinct from *M. costellata*.

When the exterior is worn off, the shell beneath is found to be of a brilliant silvery lustre, with crimson reflections, rendering it one of the most attractive shells found in our waters.

Margarita acuminata.

Shell small, orbicular, thin, whitish; spire pointed; whorls four, rounded, smooth; suture strongly impressed; aperture orbicular, iridescent within; umbilicus small.

Margarita acuminata, MIGHELS and ADAMS, Bost. Journ. Nat. Hist. iv. 46, pl. 4, fig. 15 (1842). — STIMPSON, Check Lists, 4.

Shell, small, orbicular, sub-conical, thin, of a grayish-white or russet color; spire acuminate; whorls four, well rounded, smooth, covered with a thin, semi-transparent epidermis; striæ of growth very fine and compact; suture well impressed; aperture orbicular, considerably oblique, beautifully iridescent within; operculum horny, spiral. Height, twenty-five hundredths of an inch; diameter, twenty-six hundredths of an inch; divergence, eighty degrees.

Fig. 546.

M. acuminata.

Gulf of St. Lawrence, taken from the stomach of a codfish, by Mr. Foster, in the summer of 1841. Only a single specimen was found, which is in the cabinet of J. W. Mighels.

Identical with the species described by Mr. Sowerby, "Conch. Illustr.," fig. 7, under the above name. Although Mr. Sowerby's figure agrees well with our shell, his description does not in all respects. For instance, "*anfractibus quinque.*" Our shell has but four turns. Again, "Long. 0.55, lat. 0.5 poll." Thus we see that Mr. Sowerby's shell is not only twice as large as our specimen, but *proportionally* higher. The breadth of our shell in its longest basal diameter is greater than the height. But as we have only a single specimen, we prefer to publish it with the assumption that it is identical with *M. acuminata*, rather than produce confusion by hazarding a new name for an old shell. (*Mighels* and *Adams.*)

Margarita varicosa.

Shell small, thin, conic; whorls four, convex, longitudinally ribbed, transversely striate; suture sub-canaliculated; umbilicus large, deep.

Margarita varicosa, MIGHELS and ADAMS, Bost. Journ. Nat. Hist. iv. 46, pl. 4, fig. 14 (1842). — STIMPSON, Check Lists, 4.

Shell small, thin, low, conical, of a dingy white or drab color; whorls four, convex, covered with numerous longitudinal, oblique ribs, intersected by a great number of transverse, revolving striæ, which are most conspicuous on the lower part and base of the lower whorl. The striæ on the upper part of the whorls can only be seen with a magnifier. Suture distinct, sub-canaliculate; umbilicus rather large and deep, bounded by two rather rugged varices, intersected by the ribs which are continued to the verge of the umbilicus; aperture circular; labrum simple, sharp; within perlaceous. Height, twenty-five hundredths of an inch; diameter of base equal to the height; divergence, ninety degrees. (*Mighels* and *Adams.*)

Fig. 547.

M varicosa.

Bay Chaleur, taken from the stomach of a codfish (*Mighels* and *Adams*); Fishing Banks (*Willis*).

Genus TROCHUS, LIN. 1758.

SHELL conical, axis imperforate, last whorl angulated at the periphery; columella superiorly spirally twisted, forming a canal, anteriorly simple, straight, ending in a point.

Trochus occidentalis.

Shell pale, imperforate; whorls seven, convex; carinæ light brown, smooth above; suture impressed; columella callous.

Trochus occidentalis, MIGHELS and ADAMS, Bost. Journ. iv. 47, pl. 4, fig. 16 (1842). — STIMPSON, Check Lists, 4.
Margarita alabastrum, BECK, &c.

Shell rather small, somewhat solid, sub-translucent, pale horn color, with light brown revolving carinæ, of which there are three on the upper whorls, and four to six on the lower one; whorls seven, convex; suture distinct; spire three fifths the length of the shell; apex acute; last whorl with a smooth space between the carinæ and two or three coarse revolving striæ around the umbilical region; aperture moderately depressed, transversely ovate; labrum crenulated by the carinæ; columella callous; umbilical region indented. Height, five tenths of an inch; greatest basal diameter, forty-three hundredths of an inch; divergence, sixty degrees.

Fig. 548.

T. occidentalis.

Casco Bay, taken from stomachs of haddock, in the summer of 1840, and subsequently (*Mighels* and *Adams*).

FAMILY PALUDINIDÆ, RISSO.*

SHELL conical or sub-discoidal, the margins of the aperture united posteriorly; operculated; inhabiting fresh water.

Genus VALVATA, MÜLLER. 1774.

SHELL conical, whorls cylindrical, loosely cohering; aperture circular, its margin entire; operculum orbicular.

Valvata tricarinata.

FIG. 156.

Shell sub-discoidal, thin, pale pea-green; whorls three, the last tri-carinate; umbilicus large.

Cyclostoma tricarinata, SAY, J. Acad. N. S. Phil. i. 13, 1817; Nich. Encyc. ed. 3; BINNEY'S ed. 68, 59, 56.

* In preparing this family I have largely borrowed from the "Land and Fresh-water Shells of North America," Part III. Professor Henry has allowed the use of some of the woodcuts prepared for that work. — W. G. B.

Valvata tricarinata, Say, Journ. Acad. ii. 173; Binney's ed. 68. — Deshayes, in Lam. viii. 507; Tr. El. de Conch. pl. 72, figs. 4–6. — Menke, Zeit. f. Mal. 1845, 121. — Haldeman, Mon. iii. pl. 1, figs. 1–4. — Gould, Inv. 225, fig. 156. — De Kay, N. Y. Moll. 118, pl. 6, fig. 130. — Anonymous, Can. Nat. ii. 213, fig. — Adams, Thompson's Vt. 152. — W. G. Binney, L. and Fr. Shells, iii. 9, figs. 12–16 (1865).

Valvata carinata, Sowerby, Gen. Shells, xli. fig. 2.

Valvata unicarinata, De Kay, N. Y. Moll. 118, pl. 6, fig. 129.

Valvata bicarinata, Lea? Tr. Am. Phil. Soc. ix. 21; Obs. iv. 21; Proc. ii. 81, 83; Arch. f. Nat. 1843, ii. 129.

Tropidina carinata, Chenu, Man. de Conch. ii. 312, fig. 2232.

Shell small, depressed, thin, transparent, and shining, of an emerald or light pea-green color; whorls three or four, flattened at the summit, faintly marked by lines of growth, and separated by a distinct suture; each of the interior whorls has one or two prominently raised, rounded, revolving lines or keels, and the exterior one has three, one of which issues from the lower junction of the lip and borders the umbilicus; a second originates from the upper junction of the lip, and circumscribes the whorl; the third midway between this and the suture, thus giving the whorls a prismatic or quadrangular instead of a cylindrical appearance; aperture circular, modified by the keels; lip simple, surrounding the aperture, except a small space between the two lower keels; umbilicus broad, deep, funnel-shaped. Height, one tenth of an inch; breadth, seven fortieths of an inch.

Fig. 549.

V. tricarinata.

Fig 550.

Operculum of *V. tricarinata.* Enlarged.

Var. *simplex*, without the keels. Professors Benedict and Adams have found this species in Vermont; and in very many instances it is perfectly simple and cylindrical, individuals occurring with every degree of carination, showing that it is still the same species. In this State, the large, funnel-shaped umbilicus is the best characteristic.

It is found in most of our small lakes, usually under stones, or sheltered by the deserted shells of some of the fresh-water mussels. It has also been found from Pennsylvania to Council Bluff and Methy Lake (lat. 57°).

The shell is usually rendered somewhat opaque by an earthy coating, which seems to answer the purpose of an epidermis; but, when this is removed, the surface is shining and pearly, of an emerald-green color, lighter on the keels. It is one of our most curious shells.

Valvata pupoidea.*

FIG. 155.

Shell minute, elevated, chestnut colored; whorls four or five, the last nearly disjoined.

Valvata pupoidea, GOULD, Am. Journ. Sc. 1st ser. xxxviii. 196, 1840; Inv. Mass. 226, fig. 155; Otia, 180. — HALDEMAN, Mon. 10, pl. 1, figs. 11–13. — DE KAY, N. Y. Moll. 119. — CHENU, Man. de Conch. ii. 311, fig. 2230. — ANONYMOUS, Can. Nat. ii. 214, fig. — W. G. BINNEY, L. and Fr. Shells, iii. 13, fig. 19 (1865).

Shell small, elongated-ovate, opaque, chestnut colored, when divested of the rough, dirty pigment which usually adheres closely to it; whorls four or five, minutely wrinkled, the posterior one small and flattened so as to form an obtuse apex; the others cylindrical, and so partially in contact as to expose about one half of the cylinder; the last entirely disjoined from the preceding one for at least the half of a revolution; aperture circular, lip simple and sharp; on looking at the shell from below, no umbilical opening is found; operculum horny, apex central, elements concentric. Length, one tenth of an inch; breadth, three fortieths of an inch.

Fig. 551.

V. pupoidea. Enlarged.

Found at Fresh Pond and other ponds, on stones and submerged sticks; and has been for many years in our cabinets marked as a *Paludina*.

Animal very active; head proboscidiform, half as long as the tentacles, bi-lobed in front, dark, terminated with light; tentacles rather stout, light drab colored, with a line of silvery dots on the upper side, over the large, black eyes; foot tongue-shaped, as long as the first whorl, dilated into two acute angles in front, light drab color; respiratory organ occasionally protruded to half the length of a tentacle on the right side.

This species is widely distinguished from all other described ones by its minuteness, its color, its elongated form, and its want of an umbilicus; of which characters the last two seem to arise from the loose manner in which the whorls are united.

Found also in Connecticut (*Linsley*); District of Columbia (*Girard*); Maine (*Mighels*); and Canada (*Can. Nat.*).

* This species is made the type of a new genus, *Lyogyrus*, by Professor Gill (Proc. Ac. Nat. Sci. Phil. 1863). It does not appear to me that there are sufficient grounds for believing it distinct. — W. G. B.

Genus MELANTHO, Bowditch. 1822.

Shell thick, solid, ovate, imperforate, spire produced; whorls rounded, smooth, covered with an olivaceous epidermis; peristome simple, continuous.

Melantho decisa.

Figure (see woodcut, p. 144 of 1st ed.).

Shell sub-conic, thick and strong, olivaceous; whorls five, convex, covered with minute, revolving lines, eroded at tip; aperture ovate, half the length of the shell, bluish within; umbilicus none.

Limnæa decisa, Say, Nich. Encycl. ed. 1, 1817; 2d ed. 1818, pl. 3, fig. 6.

Paludina decisa, Say, 1817, Nich Encycl. pl. 3, fig. 6 (*Limnæa* of earlier editions); Amer. Conch. i. pl. 10 (1830); ed. Binney, 49, 159, pl. 10, fig. 1; pl. 70, fig. 6; ed. Chenu, 16, pl. 2, fig. 5. — Philippi, Conch. iii. 3, pl. 1, fig. 8 (1848). — Haldeman, Mon. 4, pl. 1 (1840). — Gould, Inv. of Mass. 1st ed. 227, woodcut, p. 144 (1841). — Adams, in Thompson's Hist. of Vermont, 151, fig. (1842). — De Kay, N. Y. Moll. 84, pl. 6, fig. 131; pl. 7, 134 (1843). — Chenu, Ill. Conch. i. figs. 1–5. — Mrs. Gray, Fig. Moll. An. pl. 310, fig. 10. — Potiez et Michaud, Gall. des Moll. i. 247, pl. 25, figs. 13, 14. — Küster in Chemn. 2d ed. 13, pl. 2, figs. 14–19. — Reeve, Con. Icon. 45, *a*, *c*, *d*, excl. 45 *b* (*P. ponderosa*), Mar. 1863.

Melania ovularis, Menke, Syn. Meth. 134, teste Küster.

Paludina limosa, Valenciennes, Rec. d'Obs. ii. 253, 1833, teste Küster and Haldeman.

Paludina ponderosa, jun., Deshayes in Lam. viii. 516 (1838); ed. 3, iii. 455.

Paludina heterostropha, Kirtland, Ohio Rep. 175 (1838). — Tappan, Am. Journ. Sc. [i.] xxxv. 269, pl. 3, fig. 2, 1839.

Paludina microstoma, Kirtland, Ohio Rep. 175 (1838).

Paludina rufa, Haldeman, Mon. iii. p. 3 of wrapper, pl. 3, fig 1 (1841), 15.

Paludina cornea, Valenciennes? Rec. d'Obs ii. 255, 1833.

Paludina integra, Say, 1821; Binney's ed 69; Journ A. N Sc. ii. 174 (1821). — Haldeman, Mon. 10, pl. 3 (1840). — Adams, in Thompson's Vermont, 152 (1842). — De Kay, N. Y. Moll. 84, pl. 7, fig. 132 (1843). — Kuster, Chemn. 2d ed. 17, t. 3, figs 11–13. — Chenu, Ill. Conch. pl. 1, figs. 9–13. — Philippi, Conch. iii. 4, pl. 1, fig. 7 (1848).

Paludina genicula, Conrad, N. Fr. W. Shells, 48, pl. 8, fig. 3, 1834; ed. Chenu, 23, pl. 4, fig. 20. — Kuster in Chemn. 2d ed. 14, pl. 3, figs. 5, 6 (1852). — Müller, Syn. Test. in 1834 prom. p. 39. — Haldeman, Mon. 15, pl. 5 (1840). — De Kay, N. Y. Moll. 86 (1843). — Chenu, Illust. Conch. pl. 1, figs. 18, 19.

Paludina heros, De Kay, olim, N. Y. Prel. Rep. 1839, p. 32; Moll. 85 (1843).

Paludina decapitata, Anthony, Proc. A. N. S. Phila. 1860, p. 71. — Reeve, Con. Icon. pl. 11, fig. 75 (1863).

Paludina milesii, Lea, Proc Phila. Acad. Nat. Sc. 1863, 156.

Helix dissimilis, Wood, Ind. Suppl. pl. 7, fig. 18 (1828); Hanley's ed. 226 (1856).

Helix decisa, Eaton, Zool. Text-Book, 196 (1826).

Lymnula ventricosa, Rafinesque, MSS.

Ambloxis (*Amblostoma*) *major*, Rafinesque, MSS.

Cochlea Virginiana, &c. LISTER, Conch. t. 127, fig. 27 (1770).
PETIVER, Gazophyl. t. 116, fig. 18.
Melantho decisa, W. G. BINNEY, L. and Fr. Shells, iii. figs. 79–82 (1862), excl. syn. *sub-solida.*

Shell ovate-elongate, thick and strong, color varying from yellowish-green to dark olive-green; whorls five, regularly convex, inclining rather abruptly towards the suture, so as to form a moderate shoulder; surface marked with fine wrinkles of growth, and occasional stripes of dark purplish, indicating the position of preceding apertures; also with minute, revolving lines, which, in young specimens, when viewed in the water, are seen to be garnished with fine, pubescent hairs; two or three of the whorls at the apex are usually broken off, leaving an irregular, eroded surface; aperture oval, not exceeding half the length of the entire shell, forming an angle above; lip simple, very sharp, until, as it rises towards the columella, it becomes thickened, and, turning outwards, forms a smooth, rounded margin, leaving no umbilicus; a thick enamel spreads across the preceding whorl, margined with purplish; interior bluish. Operculum thin, ovate, beaked, with a groove from the centre to the tip of the beak. Length, one and one tenth inches; breadth, seven tenths of an inch; divergence, fifty-six degrees.

Fig. 552.

M. decisa.

Fig. 553.

Operculum of *M. decisa.*

Animal with a broad, tongue-shaped foot, drawn out into angles each side in front, of a livid olive color varied with dark, vivid, orange, transverse spots above, and minutely dotted with the same beneath; tentacula olive above, spotted with orange, lighter below. Eyes on a niche at the exterior base of the tentacula.

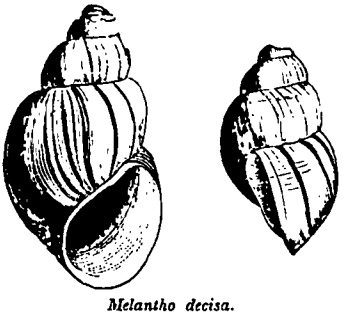
Found in ponds and muddy streams, usually concealed under shelving banks, or imbedded an inch or two among loose mud and roots.

This is the only large species inhabiting the waters of New England. It is less massive than *M. ponderosa*, its whorls more convex, and its aperture less elongated. It is less globular when young than *Vivipara sub-purpurea*, and the spire in the adult more symmetrical. The young are excluded in a living state with a shell of three complete whorls. It is peculiar for the almost constant loss of its tip.

Found in all eastern North America, from the Rio Grande to Nova Scotia and the Canadas.

[*The form known as *M. integra* has not been found in New England, but for the sake of comparison I give the following descriptions and figures: —

Fig. 554.

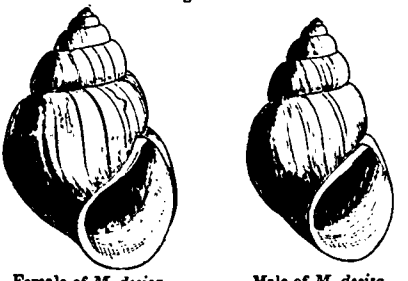


Melantho decisa.

Melantho decisa. Shell imperforate, elongate-ovate, rather thick, smooth, surface hardly broken by lines of growth, with microscopic revolving striæ; greenish, with irregularly disposed brown streaks marking the edge of former peristomes, uniformly chalky-white under the epidermis; spire truncated, one or two whorls of it alone remaining, apex entirely removed; remaining whorls three and a half, convex, the last equalling two thirds of the shell's length, imperforate; aperture oval, oblique, more than one half the length of the last whirl, bluish-white within; peristome externally of a darker color, simple, acute, somewhat sinuous, its terminations joined by a thin callus on the parietal wall, entering within the aperture. Length of axis, thirty-seven; greatest breadth of body whorl, seventeen; length of aperture sixteen; breadth, eleven mill.

Operculum arcuated, convex, horny, concentric, nucleus nearer the columellar margin.

Fig. 555.



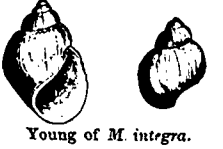
Female of *M. decisa*, var. *integra*.

Male of *M. decisa*, var. *integra*.

Melantho decisa, var. *integra*. Shell imperforate, elongate-ovate, quite thick, smooth, surface hardly broken by lines or wrinkles of growth, marked with delicate revolving striæ; greenish, with darker streaks, marking the edge of former peristomes, uniformly chalky-white under the epidermis; spire elongated-conic, apex perfect, acute; whorls five, convex, the last equalling two thirds the shell's length, imperforate; aperture oval, narrowed above, oblique, more than half the length of the body whorl, milky-white within; peristome externally of a darker color, simple, acute, somewhat sinuous, its terminations joined by a thin, transparent callus on the parietal wall of the aperture, more heavily thickened and white above and below. Length of axis, twenty-four; greatest breadth of body whorl, fifteen; length of aperture, fifteen; breadth, eleven mill.

Operculum as in *M. decisa*.

Fig. 556.



Young of *M. integra*.

In general terms it may be said that the form known as *M. integra* differs from *M. decisa* by being more elongated, having a perfect apex, a smaller and whiter aperture, and more prominent revolving striæ. These characters are only comparative. The two forms are not distinguished by any decided, constant, specific characters. Fig. 556 represents young shells, which are more globose, comparatively, than the more mature ones.

* The remarks in the brackets are by me. — W. G. B.

All the shells figured are from western localities, excepting Fig. 554, which are from the Delaware and Susquehanna Rivers, and Fig. 552, which is from Massachusetts.]

Genus AMNICOLA, Gould and Haldeman. 1841.

Shell ovate-conic, thin; spire acute, composed of a few rounded whorls; aperture small, oblique, rounded-ovate; lips continuous, simple; operculum horny, spiral, with a few volutions.

Animal having an elongated foot, rounded posteriorly, with each anterior angle produced laterally; head half the breadth of the foot, and protruding beyond it; tentacula short, filiform, unequal? the eyes seated at the side of the external base; oviparous. Inhabits fresh water.

That this group of small shells should be separated from *Paludina* and also from *Cyclostoma*, in which genus they were included by Cuvier, is clear from the structure of the operculum, but more especially from the structure and habits of the animal. Among the differences the following are the most obvious: in this genus the head precedes the foot in progression; in *Paludina* it is the contrary; in this the tentacula are all the way of a size, and without any enlargement for the reception of the eyes, instead of being tapering, with a niche for the eyes; they are also frequently, if not always, unequal in length; perhaps this is a sexual difference. The animal has the power of rising and swimming in an inverted posture at the surface of the water, which the true *Paludina* never does. So far as observation has yet gone the *Amnicola* is oviparous, while the true *Paludina* is ovo-viviparous. It is found crawling upon stones, sticks, and aquatic plants, while *Paludina* remains upon the mud, and is usually observed partly, or entirely, imbedded in it. On these grounds Mr. Haldeman concurs with me in instituting the genus *Amnicola*. Its position seems to be intermediate between *Paludina* and *Melania*.

Fig. 557.

Operculum of *Amnicola*. Enlarged.

Amnicola pallida.

Shell thin, conical, whorls four and a half, convex, suture distinct; umbilicus narrow; aperture ovate-orbicular, angular posteriorly.

Amnicola pallida, Haldeman, Mon. part 4, pp. 3 and 4 of wrapper (1842); Mon. 12, pl. 1, fig. 7 (1844?). — W. G. Binney, L. and Fr. W. Shells, iii. 83, fig. 165 (1865).
Amnicola lustrica, Adams, Thompson's Vermont, 169, 152 (1842), teste Haldeman.

Shell thin in texture, conical, rather robust, composed of four and a half convex whorls, separated by a well-marked suture; spire obtuse, rather longer than the aperture; umbilicus narrow; aperture ovate-orbicular, forming an angle posteriorly; a small portion of the labium confluent with the body whorl posteriorly. Color pale ochraceous, translucent.

Fig 558.

A. pallida.

Inhabits Lake Champlain (*Adams*).

Intermediate between *lustrica* and *porata*. It is not as short and transverse as the former, which, moreover, is widely umbilicate, and has the aperture regularly rounded posteriorly. According to the description of Professor Adams, the labium sometimes scarcely touches the body of the shell. The spire is comparatively longer than in *porata*, the outline less transverse, and the aperture not orbicular (*Haldeman*).

Hartford (*Linsley*).

Amnicola limosa.

Fig. 157.

Shell small, sub-globose, thin, smooth; whorls four, very convex, suture deep; aperture nearly circular; inner lip barely touching the preceding whorl; umbilicus large.

Paludina limosa, Say, Journ. Ac. Nat. Sc. Phila. i. 125 (1817); Nich. Encyc. 3d ed. (1819); Binney's ed. 61. — De Kay, N. Y. Moll. 88.

Paludina porata, Adams, in Thompson's Hist. of Vt. 152 (1842) (teste Hald.). — Philippi, Z. für Mal. ii. 77 (1845).

Amnicola porata, Gould, Inv. of Mass. 1st ed. 229, fig. 157 (1841).

Amnicola limosa, Haldeman, Mon. 10, pl. 1, figs. 5, 6 (1844?). — Anonymous, Can. Nat. ii. 214, fig. (1857). — W. G. Binney, L. and Fr. W. Shells, iii. 84, fig. 166 (1865).

Shell minute, conic-globose, thin, translucent, smooth, or with most delicate lines of growth; varying from a bronze-green to a light olive-green color, but usually invested with mud; whorls four or less, very convex, and flattened near the suture, so as to present a conspicuous shoulder; the last whorl rather more than two thirds the length of the shell, and as broad as long; suture deeply impressed, almost channelled; aperture nearly circular, both lips being about equally curved, and uniting posteriorly at a broad angle; lips sharp, in some instances a little everted; inner lip at maturity, barely touching the preceding whorl just before it joins the outer lip, leaving a very large, deep umbilicus. Length, three twentieths of an inch; breadth, five tenths of an inch; divergence, sixty-eight degrees.

Fig. 559.

A. limosa.

Found in ditches and brooks, clinging to stones and submerged plants, oftentimes in great numbers.

Animal a light drab color tinted pink, the head a little flesh-colored above; tentacula silvery, with a dark line running along the outside from the eyes, which are at the external base; foot not reaching beyond the first whorl, broadly rounded behind, dilated into angles at each side in front; head half the width of the foot, and projecting beyond it, motions very slow. In delicate and clean specimens, a dark mark parallel to the outer lip, and another bisecting it, and belonging to the animal, appear through the shell.

Under this species I include many small shells, hitherto regarded as *Paludinæ*, which are collected in this region, ascribing the very great differences they present in color and size to differences of locality and age. The shoulder of the whorls, the conspicuous umbilicus, and the rounded aperture, almost like *Valvata* or *Cyclostoma*, are the most obvious characters. It is less solid, less elongated, the aperture more circular, and the inner lip much less closely appressed to the preceding whorl than *A. limosa*, Say. *A. lustrica*, Say, is described as much smaller, much more elongated, and more cylindrical. This I strongly suspect to be identical with *Valvata pupoidea* in an immature state. It approaches nearest to *A. Cincinnatiensis*, Anthony, which is larger and more conical and elongated.

From Hudson's Bay and Wisconsin to Virginia; Nova Scotia (*Willis*).

Amnicola granum.

Paludina grana, Say, Journ. A. N. Sc. ii. 378 (1822); Binney's ed. 110.
Amnicola granum, Haldeman, Mon. 17 (1844 ?). — De Kay, N. Y. Moll. 88 (1843). — W. G. Binney, Land and Fr. W. Shells, iii. 86, fig. 170.

Shell conic-ovate; whorls not perceptibly wrinkled, convex; suture deeply impressed; aperture orbicular, hardly angulated above; labium with the superior edge appressed to the surface of the penultimate volution; umbilicus rather small, profound. Length, less than one tenth of an inch.

Fig. 560.

A. granum. $\frac{3}{1}$

Inhabits Pennsylvania.

This very small species is found in plenty in the fish-ponds at Harrowgate, crawling on the dead leaves which have fallen to the bottom of the water. It resembles *P. lustrica*, but is a smaller, less elongated shell, and the superior portion of the la-

bium is not an unaltered continuation of the lips as in that shell, but is appressed to the surface of the penultimate whorl in the usual manner of calcareous deposition upon that part (*Say*).

Ranges from Lake Superior to Virginia. New Haven (*Linsley*).

Fig. 560 is drawn from an authentic specimen given by Mr. Say to the Philadelphia Academy.

Genus POMATIOPSIS, Tryon. 1862.

Shell small, thin, smooth, long, sub-umbilicate. Spire turreted. Aperture ovate, peritreme reflected. Operculum corneous.

Pomatiopsis lapidaria.

Shell turreted, sub-umbilicate; whorls six, indistinctly wrinkled; suture impressed; aperture long, ovate-orbicular.

Cyclostoma lapidaria, Say, Journ. A. N. S. Phila. i. 13 (1817); Binney's ed. 59.
Amnicola lapidaria, Haldeman, Mon. 18, pl. 1, fig. 10 (1844 ?); Journ. A. N. S. Phila. viii. 200 (1842).
Paludina lapidaria, Say, Nich. Encyc. 3d ed. (1819); Binney's ed. 56. — Küster, in Chemn. 2d ed. 54, pl. 10, figs. 21, 22. — De Kay, N. Y. Moll. 86 (1843).
Melania lapidaria, Lewis, Bost. Proc. viii. 255; Phila. Pr. 1862, 290 (no descr.).
Pomatiopsis lapidaria, Tryon, Proc. Phila. Acad. 1862, 452 (no descr.). — W. G. Binney, L. and Fr. W. Shells, iii. 93, figs. 186–188.

Shell turreted, sub-umbilicate, with six volutions, which are obsoletely wrinkled across; suture impressed; aperture longitudinally ovate-orbicular, operculated, rather more than one third of the length of the shell. Length, about one fifth of an inch.

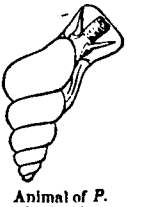
Fig. 561.

P. lapidaria.

Collection of the Academy of Natural Sciences.

Inhabitant not so long as the shell, pale; head elongated into a rostrum as long as the tentacula, and emarginate at tip; tentacula two, filiform, acuminated at tip, short; eyes prominent, situated at the external or posterior base of the tentacula; base or foot of the animal dilated, oval, obtuse before and behind.

Fig. 562.



Animal of *P. lapidaria.* Enlarged.

Found under stones, &c., in moist situations, on the margins of rivers. Like those of the genera *Limnæa* and *Planorbis*, this animal possesses the faculty of crawling on the surface of the water in a reversed position, the shell downward (*Say*).

This is a widely distributed species, ranging at least from Georgia

to New York, and from Missouri to Michigan. It is also found in the postpleiocene of the Mississippi River bluffs.

Housatonic River (*Linsley*).

FAMILY LITTORINIDÆ, GRAY.

SHELL spiral, turbinated or depressed; aperture simple in front, never pearly within.

Genus SKENEA, FLEMING. 1828.

SHELL minute, discoidal; whorls few, and destitute of spines; aperture dilated; operculum horny.

Skenea planorbis.

FIG. 189.

Shell minute, discoidal, concavely umbilicated beneath, horn colored, whorls three, mouth expanded.

Turbo planorbis, O. FABRICIUS, Fauna Gr. 394.
Skenea planorbis, FORBES and HANLEY, &c.; STIMPSON, Shells of New England, 35; Check Lists, 4.
Skenea serpuloides, of American not European authors, GOULD, Inv. 1st ed. p. 247, fig. 189.

Shell minute, flat, slightly convex above, and broadly concave below, forming a deep umbilicus, which displays all the whorls within; whorls three, smooth, a little depressed, light horn color; apex scarcely elevated; suture channelled; aperture turning downwards, circular, somewhat trumpet-shaped, in contact with, but not embracing any part of, the preceding whorl; lip sharp, and receding so as to form an acute gap as it joins the preceding whorl; operculum horny, multispiral, the apex central. Breadth, one twentieth of an inch; height, one thirtieth of an inch.

Fig. 563.

S. planorbis.

Clings to stones lying about low-water mark. I have found it occasionally, but Professor Adams has found it in great numbers along the southwestern shore of East Boston. Nova Scotia (*Willis*); Cape Cod, northward (*Stimpson*).

Genus RISSOELLA, GRAY. 1847.

SHELL thin, spiral, conical, or sub-globose, transparent; aperture ovate, rounded and simple in front, peristome thin, entire.

Rissoella? eburnea.

Rissoa eburnea, STIMPSON, Proc. Bost. Soc. iv. 14 (1851); Shells of New England, 34, pl. 1, fig. 1.
Rissoella? eburnea, STIMPSON, Check Lists, 4.

Shell small, ovate-conoid, white, shining, smooth; whorls four, rather convex, sub-angulated at suture; aperture ovate-elliptic; peristome thin, simple, acute, effuse anteriorly. Length, sixteen hundredths of an inch; breadth, nine hundredths of an inch.

Fig. 564.

R.? eburnea. Enlarged.

This species resembles some varieties of *R. ventrosa*, but is much more angular. Two specimens were taken in thirty fathoms, off Cape Ann (*Stimpson*).

Rissoella sulcosa.

Shell minute, ovate-conic, smooth; whorls four, sub-convex, transversely furrowed; suture impressed; aperture ovate-oblong, transversely banded within.

Phasianella sulcosa, MIGHELS, Bost. Journ. iv. 348, pl. 16, fig. 4 (1843).
Rissoella? sulcosa, STIMPSON, Check Lists, 4.

Shell very small, ovate-conical, smooth and white; whorls four, slightly convex, with six or seven transverse grooves on the body whorl, and three on each of the two next above, spire smooth and pointed; aperture ovate-oblong, with three slightly apparent transverse bands within, as seen under a strong magnifying power. Length, one tenth of an inch; breadth, about one twentieth of an inch.

Fig. 565.

R. sulcosa.

Casco Bay.

Examined with the unassisted eye, this shell would be likely to be mistaken for some species of *Cingula*, but its true character is revealed with even a moderate magnifying power, the lip being *incontinuous* posteriorly. I have never discovered but one specimen of this curious little shell; this I found in the stomach of a haddock, in the summer of 1842. I presume it is the only representative of the genus that has been hitherto discovered on our Atlantic coast (*Mighels*).

Genus RISSOA, FREMENVILLE. 1814.

SHELL usually white, solid, conical; spire pointed, many whorled, whorls convex and smooth, or longitudinally ribbed; aperture ovate; outer lip more or less dilated and thickened externally.

Rissoa minuta.

FIG. 171.

Shell minute, elevated, conic, thin, smooth, yellowish-green; whorls five, convex; suture distinct.

Turbo minutus, TOTTEN, Sillim. Journ. xxvi. 369, fig. 7.
Cingula minuta, GOULD, Inv. 1st ed. 265, fig. 171. — DE KAY, N. Y. Moll. 110, pl. 4, fig. 117.
Rissoa minuta, STIMPSON, Check Lists, 4.
Paludina stagnalis (*forma ventr.*), MIDDENDORF, Reise, 34.

Shell minute, ovate-conic, elevated, obtuse at apex, thin, yellowish-brown, or dark horn color when containing the animal; usually coated with a dark green pigment, or some minute vegetable; whorls five, convex, faintly wrinkled by the lines of growth, the two upper ones forming an obtuse apex, and the lowest less than two thirds the whole length of the shell; suture distinct, with a slight shoulder to the whorl near it; aperture about one third the length of the shell, oval, the lips united in mature shells by a loosely attached enamel, which rises before an umbilical pit; operculum horny, subspiral. Length of large specimens, three twentieths of an inch; breadth, one tenth of an inch; divergence, twenty-eight degrees.

Fig. 566.

R. minuta.

Animal; head proboscidiform, dusky-brown or blackish, half as long as the black-tipped tentacula; eyes on a partial peduncle or dilatation on the exterior base of the tentacula; region of the mouth, the tentacula, and a stripe each side of the neck, leaving a pyramidal dark line between, of a light drab color; foot oval, bifid, and dilated into wings before, rounded behind, dusky above and pale beneath. Motions very active.

Found plentifully on sea-weed, and on moist banks, about high-water mark, especially on the thread-like plants which grow in ditches and brackish pools about marshes, in company with *Littorina tenebrosa*.

Whole coast of New England (*Stimpson*); Halifax (*Willis*); Green Island (*Bell*); fossil, Montreal (*Dawson*).

It is closely allied to several species received from Europe, and perhaps identical with some one of them; as the *Littorina Balthica*, from Copenhagen; the *Turbo ulvæ*, from England; and the *Paludina thermalis*, from France. But, as the shell has been submitted to Mr. Sowerby, and he did not pronounce it a European species, but sent the last-named shell as the nearest allied to it of all the species with which he is acquainted, and as it certainly is not iden-

tical with that, I shall not venture to claim for it any more remote history than that given by Colonel Totten.

This shell is so plain as to present no striking mark of distinction, and it is consequently not easy to describe it. The only shell liable to be confounded with it are the *Odostomia fusca* and *O. bisuturalis;* a slight examination of the aperture readily solves any doubt on this point.

Rissoa latior.

Cingula latior, MIGHELS and ADAMS, Bost. Journ. N. H. iv. 48, pl. 4, fig. 22 (1842).
Rissoa latior, STIMPSON, Shells of New England, 34; Check Lists, 4.

Shell minute, ovate-conic, smooth, pale horn color; whorls more than four, convex; suture much impressed; last whorl broad, larger than the rest of the shell; aperture ovate-orbicular, left margin with a lamina; operculum horny. Length, eight hundredths of an inch; breadth, five hundredths of an inch; divergence, sixty degrees.

Fig. 567.

R. latior.

Casco Bay; taken from the stomach of a haddock in the spring of 1841.

It is in the cabinet of J. W. Mighels.

This species has a slight resemblance to *R. minuta*, Totten, in the absence of sculpture; but the spire is shorter, more pointed, and its divergence is much greater, giving a very different form to the shell. It is, moreover, a much smaller shell. It appears also to be allied to *Turbo reticulatus*, Montagu, but is distinct from that species in not having as many turns by one and a half; it differs, also, in not being "*strongly* striate, both longitudinally and transversely," and in not having the "aperture thickened by a rib." It has been found very rarely, usually in company with *R. carinata* and *Cingula arenarius*, Montagu (*Mighels* and *Adams*).

Rissoa aculeus.

FIG. 172.

Shell minute, sub-cylindrical; whorls convex, covered with regular, microscopic revolving lines; aperture ovate; umbilicus partial.

Cingula aculeus, GOULD, Inv. 1st ed. 266, fig. 172. — DE KAY, N. Y. Moll. 111, pl. 6, fig. 115.
Rissoa aculeus, STIMPSON, Check Lists, 4.

Shell minute, ovate-cylindrical, elongated, light yellowish horn color; whorls six, convex and separated by a deep sutural region;

the two upper forming a blunt apex, the lowest rather more than half the length of the shell; the whole covered with regular, crowded, microscopic revolving lines; aperture one third the length of the shell, oval, oblique, angular behind, the margin simple and entire, barely touching the preceding whorl, somewhat expanded, and on the left side elevated, and slightly turned over an umbilical depression or chink; operculum horny. Length, three twentieths of an inch; breadth, one fifteenth of an inch; divergence, twenty-three degrees.

Fig. 568.

R. aculeus.

Found sparingly on the partially decayed timbers of an old wharf; and plentifully on stones, about low-water mark, at East Boston. Gull Island (*Smith*); whole New England coast (*Stimpson*).

It is a small, but well-characterized shell, distinguished by its elongated form, its entire aperture, and the minute spiral lines with which it is covered. It is nearly as long as, and much more slender than, *R. minuta*. Brown figures two or three species which closely resemble this.

[Animal white throughout, head moderately produced, deeply bifid; foot very little dilated at anterior angles; eyes black; motions very moderate; swims inverted at surface.

Rissoa multilineata.

Rissoa multilineata, STIMPSON, Bost. Proc. iv. 14 (1851); Check Lists, 4.

Shell minute, oblong-ovate, blunt, white; whorls five, convex, marked with about twenty minute, transverse striæ; aperture orbicularly ovate, peristome not thickened, effuse. Length, one tenth of an inch; breadth, forty-five thousandths of an inch.

Fig 569.

R. multilineata. Enlarged.

This shell differs from *R. aculeus* in being shorter; its whorls are much more compactly coiled, and its revolving striæ are stronger and more evident. The lip is also more thickened. From *R. Mighelsii* it differs in having much more numerous and crowded transverse striæ.

It was dredged in five fathoms, off Great Misery Island, and also near Nahant, on sandy and gravelly bottoms (*Stimpson*); Halifax (*Willis*).

Rissoa Mighelsi.

Cingula arenaria, MIGHELS and ADAMS, Bost. Journ. iv. 49, pl. 4, fig. 24 (1842), not *Turbo arenarius*, MONTAGU.
Rissoa Mighelsi, STIMPSON, Proc. Bost. Soc. iv. 15; Check Lists, 4.

Shell minute, white, sub-cylindrical, sub-plicate longitudinally, and minutely striate transversely; spire elongated, conical; whorls six, convex; suture impressed; aperture sub-orbicular, half the length of the spire; operculum horny. Length, ten hundredths of an inch; breadth, five hundredths of an inch; divergence, thirty degrees.

Fig. 570.

R. Mighelsi.

Casco Bay, taken from the stomach of a haddock in the summer of 1841.

But few specimens have been found, which are in the cabinet of J. W. Mighels (*Mighels* and *Adams*).

Rissoa exarata.

Rissoa exarata, STIMPSON, Proc. Bost. Soc. iv. 15 (1851); Shells of New England, 34, pl. 1, fig. 3; Check Lists, 4.

Shell small, ovate, fuscous, rather solid, imperforate; whorls five, rather convex, sub-plicate posteriorly and bound by inequidistant, elevated, transverse ribs, three on upper whorls; aperture small, ovate, peristome thickened. Length, eleven hundredths of an inch; breadth, five hundredths of an inch.

Fig. 571.

R. exarata. Enlarged.

A single specimen of this very distinct species was dredged in three fathoms, on a shelly bottom in Boston Harbor. It is distinguished by its very prominent, distant, transverse ribs, which are three on the upper whorls and eight on the lower. Its aperture is very small (*Stimpson*).

Rissoa carinata.

Shell very small, ovate; whorls five, convex, carinated below, plicated above; spire conical; suture strongly impressed; aperture sub-orbicular; operculum horny.

Cingula carinata, MIGHELS and ADAMS, l. c. in remarks.
Cingula semicostata, MIGHELS and ADAMS, Bost. Journ. N. H. iv. 49, pl. 4, fig. 23 (1842), not *Turbo semicostatus*, MONTAGU.
Rissoa pelagica, STIMPSON, Bost. Proc. iv. 15; Shells of New England, 34.
Rissoa carinata, STIMPSON, Check Lists, 4.

Shell very small, ovate-conical, of a ferruginous red color, very thin, whorls for the most part five, convex; with longitudinal ribs

on the upper half, and revolving impressed striæ on the lower half; last whorl carinate; spire conical, obtuse, suture well impressed; aperture nearly orbicular; labrum thin, sharp; labium smooth, operculum horny. Length, eleven hundredths of an inch; breadth, seven tenths of an inch; divergence, forty-five degrees.

Fig. 572.

R. carinata. Enlarged.

Casco Bay; taken from the stomachs of haddock in the summer of 1841.

We offer this with some hesitation as identical with *Turbo semicostatus*, Montagu. If it should finally prove to be distinct, we would propose to call it *Cingula carinata* (*Mighels* and *Adams*).

Grand Manan (*Stimpson*).

Genus LACUNA, Turton. 1827.

Shell globose or conical, thin; spire consisting of a few rapidly enlarging whorls; aperture semi-lunar; inner lip oblique, flattened; umbilicus forming a lengthened groove along the pillar.

Lacuna vincta.

Figs. 169, 178*.

Shell small, ovate-conical, with five rounded volutions, encircled by four or five purplish-brown bands, and very numerous, minute, undulating lines.

Turbo vinctus, Montagu, Test. Brit. 307, pl. 20, fig. 3. — Turton, Conch. Dict 195, figs. 92, 93. — Wood, Index, pl. 31, fig. 69. — Dillwyn, Catal. ii. 844. — Maton and Rackett, Lin. Trans. viii. 167.

Turbo quadrifasciatus, Fleming, Brit. Anim. 299.

Lacuna pertusa, Conrad, Journ. Acad. Nat. Sc. vi. 266, pl. 11, fig. 19.

Lacuna vincta, Gould, Inv. 1st ed. 262, figs. 169, 178*. — De Kay, N. Y. Moll. 111, pl. 6, fig. 119. — Stimpson, Check Lists, 4.

Shell small, thin, ovate-conic; spire pointed, composed of five very convex whorls, separated by a fine and deep suture, of a dingy white or purplish horn color; the lower one encircled by four darker chestnut colored bands, two of which revolve upon the posterior whorls also; the surface is also marked by faint lines of growth, and numerous, flexuous, revolving marks, which require a magnifier to render them conspicuous; aperture nearly orbicular; outer lip sharp, thin, and simple, pillar lip white, flattened, and excavated by a smooth, crescent-shaped groove, terminating in an umbilicus; as the two margins join each other at the base, they form a slight projecting

Fig. 573.

L. vincta.

angle. A slight angular ridge revolves from the upper angle of the aperture, on some specimens quite perceptible. Operculum horny, sub-spiral. Length, one half inch; breadth, three tenths of an inch; divergence, fifty-eight degrees.

Var. *fusca*. Fig. 178*. Shell proportionally shorter, more solid and opaque, of a darker, generally uniform color, sometimes yellowish, and sometimes purplish horn color, occasionally with one or two bands, or banded shades; the mouth more angular, and the angular revolving ridge more frequently conspicuous.

Found, driven up, on all our beaches, and alive among the roots of *Laminaria* and other marine plants, attached to stones and shells, and dragged by storms from deep water. Eastport (*Cooper*); Fishing Banks (*Willis*); whole coast of New England (*Stimpson*).

It is easily distinguished from all our shells by its peculiar umbilicus, and its elongated form, by which it is distinguished from the next species. The size above given is larger than in most specimens, but not so large as in many. It is undoubtedly the *L. vincta* of the British shores, as settled by actual comparison and the opinion of Mr. Sowerby. Mr. Conrad seems not to have been acquainted with the *L. vincta*, when he described his *L. pertusa*, distinguishing it from *L. quadrifasciata*. The variety is found in about equal numbers with the type. It does not depend on age; for small young specimens are proportionally short, dark, and solid. But the approaches to each other are so insensible, that I do not venture to make a species of it; but attach to it, as a variety, a name some years since proposed for it by Dr. Binney. It may prove to be a technical species, and perhaps is actually the *Turbo canalis*, Montagu.

Lacuna neritoidea.

Fig. 170.

Shell globular-ovate, with three whorls and a half, the last very large, smooth, yellowish-green; aperture semi-lunar, oblique; umbilicus large and deep.

Lacuna neritoidea, Gould, Sillim. Journ. xxxviii. 197; Inv. 1st ed. 263, fig. 170. — Stimpson, Check Lists, 5.

Shell small, thin, hemispherical, or obliquely-ovate; whorls three and a half, regularly convex, minutely wrinkled near the suture, and with an occasional transverse scratch; otherwise smooth, and covered with a rough, greenish-yellow epidermis; the sutural region is depressed and sub-channelled; the spire is scarcely prominent above the very large lower whorl, and is placed a little to one side; aper-

ture oblique, semi-circular, angles a little rounded; outer lip sharp; inner lip straight, like a rounded white rib, broadest and twisted behind; at the side of it is a narrow, crescentic, white space, bounded externally by the continuation of the sharp lip, along which a groove runs, terminating in a deep umbilicus; operculum horny, sub-spiral. Length, one fifth of an inch; greatest breadth, one fourth of an inch; divergence, ninety-five degrees.

Fig. 574.

L. neritoidea.

A few specimens of this shell have been collected at different times on Chelsea Beach. It is probably floated ashore on sea-weed. Ocean House, Swampscott (*Haskell*); fossil, Montreal (*Dawson*); whole New England coast (*Stimpson*).

It is sufficiently distinct from specimens of *Turbo pallidulus*, sent me from Europe for comparison, by its narrower channelled space, and its smaller umbilicus; and more especially by the aperture not being at all trumpet-shaped, or angular, as in that shell. They are so nearly alike, however, that it is very difficult to delineate, either by description or figures, distinctions which are very obvious on inspection. I have received it from Dr. Lovèn, labelled, doubtfully, *L. Montagui*, Turton.

Genus LITTORINA, Férussac. 1821.

Shell thick, top-shaped, spire of a few rounded whorls; aperture entire, rounded-ovate, large; outer lip sharp, inner lip somewhat flattened; lips not continuous posteriorly; operculum horny, spiral.

Littorina rudis.

Fig. 165.

Shell strong and coarse, volutions convex and well defined, with revolving ridges; pillar flattened, prolonged so as to form an angle in front; color yellowish.

Turbo rudis, Donovan, Brit. Shells, i. t. 33, fig 3 (1800). — Montagu, Test. Brit. 304. — Turton's Lin. iv. 480; Conch. Dict 197. — Chemn. Conch. v. t. 185, fig. 1855. — Maton and Rackett, Lin. Trans. viii. 159, t. 4, figs. 12, 13. — Wood, Index, pl. 30, fig. 7. — Lam. An. sans Vert. 1st ed. vii. 49. — Fleming, Brit. Anim. 298.

Turbo obligatus, Say, Journ. Acad. Nat. Sc. ii. 241.

Littorina rudis, Gould, Inv. 1st ed. 257, fig. 165. — De Kay, N. Y. Moll. 104, pl. 5, fig. 103. — Stimpson, Check Lists, 5.

Shell broad-ovate, strong and coarse, generally yellowish or ash colored, sometimes orange or olive, for the most part of one uniform

color, but occasionally banded with white, or blotched with some lighter color; surface marked with very perceptible and sometimes conspicuous revolving lines and grooves; whorls four or five, convex, well defined by the suture, forming a moderately elevated spire, rather obtuse at its apex; last whorl three fourths the length of the shell; aperture one half the same, obliquely broad-ovate; outer lip bevelled within to a sharp edge; the pillar margin is broadly flattened, and, widening forwards, projects so as to form an angle; within colored, generally brown, except the bevelled edge, which is yellowish-white; operculum horny, sub-spiral; sometimes a small umbilical indentation is found. Length, one half inch; breadth, two fifths of an inch; divergence, sixty-eight degrees.

Fig. 575.

L. rudis.

Found on rocks of the ocean shore. Prince Edward's Island, Labrador, Newfoundland (*Willis*); Gull Island (*Smith*); whole New England coast (*Stimpson*).

It is usually of a much smaller size than above mentioned. Indeed, had it not been for a few large specimens sent me by Dr. L. M. Yale, from Martha's Vineyard, which correspond in every respect with specimens of *L. rudis* received from Mr. Sowerby, I should not have recognized the species. The small specimens, such as we usually find on the ocean rocks, answer well to Mr. Say's description of *Turbo obligatus*, and were doubtless the shells intended by him. They are usually darker colored, and more mottled, than adult specimens. Mr. Say thought his specimens might be mere varieties of his *T. palliatus*, with obtuse, elevated, revolving lines. He must have inadvertently associated them with that species, to which they have no affinity, instead of with his *T. vestitus*, to which they are closely allied, and from which they would not be distinguished by the unpractised eye. The conviction that they are the *L. rudis* has greatly diminished the number of what I had regarded as varieties of *L. tenebrosa*.

The variations consist in the greater or less prominence of the revolving lines; sometimes these are almost imperceptible, and at others they would bear the name of ribs. The coloring is principally yellow, of various shades; some small specimens are quite white; many are olive and gray. Dr. Lovèn has named a flesh-colored variety *L. incarnata*.

From *L. palliata* it is distinguished by its more elevated spire, and distinctly defined whorls, its striated surface, and the compression of the lip in front, so as to form an angle; from *L. tenebrosa*,

it differs in its less elongated spire, its larger aperture, encircled as it were by a broad, thick, flattened rim.

I have not seen the *animal*, but Montagu says it is yellowish, without stripes or spots; the tentacula of the same color, marked with a dusky streak on the outside. If so, we should have another decisive distinguishing mark.

After long and careful observation and study of the myriads of specimens on our shores, so infinitely varied in proportions, coloring, and sculpture, I have become satisfied in my own mind to what species they should be referred. The limits of the species too, in adult specimens, are decidedly marked both by the shells themselves and by the animals. But, as to the young, to use the language of Montagu, "the shades and gradations are so intimately blended, that it is scarce possible to determine what marks a characteristic line of division." The angle of the front I regard as the most constant character of the last species.

It seems almost incredible that Mr. Say should have drawn upon the State of Maine for specimens of shells which are so extensively distributed and so innumerable with us; and still more incredible that, from the few specimens which he probably received, he should have discriminated and described the three species so accurately, though, if my conclusions are correct, some of them were previously described.

Littorina tenebrosa.

FIG. 166.

Shell ovate-conical; spire elevated, whorls tumid, with numerous revolving lines, dark green or dusky brown, with interrupted cream-colored lines; aperture circular; purplish-chocolate within.

Turbo tenebrosus, MONTAGU, Test. Brit. 303, t. 20, fig. 4. — WOOD, Ind. pl. 30, fig. 6. — MATON and RACKETT, Lin. Trans. viii. 160, pl. 4, fig. 12. — DILLWYN, Catal. ii. 818. — TURTON, Conch. Dict. 197, figs. 36, 37. — BROWN, Conch. of Great Brit. &c. — FLEMING, Brit. Anim. 298.

Turbo vestitus, SAY, Journ. Acad. Nat. Sc. ii. 241; ed. BINNEY, 82.

Littorina tenebrosa, GOULD, Inv. 1st ed. 259, fig. 166. — DE KAY, N. Y. Moll. 105, pl. 6, fig. 106.

Littorina rudis, part, STIMPSON, Shells of New England, 33

Shell small, ovate-conical, rather thin, dark olive or dusky brown, usually prettily checkered with buff-colored broken lines, generally obscured by a gray or rusty coating; spire elevated and pointed, of five or six rounded, tumid whorls, marked with obscure revolving lines; suture well defined; lower whorl two thirds the length

of the shell; aperture less than one half, nearly circular; outer lip thin and sharp, yellowish, thickening a little as it meets the flattened and slightly everted pillar lip, forming a slightly perceptible angle at base; throat deep chocolate or purplish-brown; operculum thin, shining, horny, brown. Length, one half inch; breadth, seven twentieths of an inch; divergence sixty-five degrees.

Fig. 576.

L. tenebrosa.

This species is found about sluggish waters, wharves, bridges, ditches, and pools upon marshes, on the mud, and climbing culms of grass. It is often found on the marshes at a considerable distance from any water, but I do not recollect that I have ever found it at the open sea, where it was liable to sustain any violence from currents or the surf.

The animal has a dark olive head, and an olive stripe on the tentacula, from the eye; the sides of the foot are beautifully lined with the same, and it is very sluggish in its movements. It lives a week or more after being removed from the water.

Actual comparison of our shell with the British *Turbo tenebrosus*, the authority of Mr. Sowerby, its correspondence with the descriptions and figures above cited, and the similarity of habit, render their identity quite certain.

Its distinctive points are, the elevation of the spire, formed of very tumid whorls, abrupt and not sloping at the suture; the short, nearly circular mouth, with its thin, yellow lip, the very partial flattening of the inner lip producing a very slight angular curve in front; the dark purplish-brown interior; and above all, the olive-colored head and markings of the animal.

Its varieties of form are not great, consisting in the greater or less elevation of the spire. In coloring it is not so variable as *L. palliata*. It is generally very dark green, interrupted with dashes of buff; but sometimes it is dark chocolate color, or light gray, and the widest variety I have seen is a dark brown, with one, two, or three bands of white. In sculpture there is considerable variation, consisting in the deeper or more superficial revolving grooves. In most cases, however, there are none distinctly visible to the naked eye.

The limits of the species are not very readily declared; but I now suppose it to be a less variable species than I had at first thought. Some further remarks on it may be found under *L. rudis*.

Halifax (*Willis*); whole Canadian coast (*Bell*); James's Bay, fifty-two degrees, ten minutes (*Drexler*).

Littorina litorea.

Turbo littoreus, Lin. Syst. Nat. 12th ed. p. 1232, &c.
Turbo ustulatus, Lamarck, An. sans Vert. (ed. Desh.), ix. 214.
Littorina vulgaris, Sowerby, Genera Shells, Litt. fig. 1.
Littorina littorea, Johnston, Berwick Club, i. 267.
Littorina litorea, Menke, Zeitsch. Malakozool. 1845, 49. — Stimpson, Check Lists, 5.

Solid, not smooth, yet rarely ridged; whorls not rounded, but more or less flattened; base and pillar not so produced, and aperture not so filled up anteriorly as in *rudis;* outer lip joining the body at an acute angle, and more arched below than above; pillar lip not peculiarly broad, usually white, its inner edge for the most part well arcuated.

Fig. 577.

L. litorea.

Like most littoral shells, the species of this genus are liable to great changes of shape and color; the former arises chiefly from the amount of elevation displayed by the spire. Hence, the form ranges from sub-globose to ovate-acute, which last we regard as the most ordinary and characteristic appearance. The shell is solid, a little glossy, and its coloring is either of a uniform tint, or disposed in rings. Impure scarlet, black, fulvous, or brown, are the usual tints; the two latter are often zoned with numerous narrow fillets of red, or smoke color. There are six or seven volutions divided by a fine and simple suture, and terminating in a more or less acute apex. They are spirally girt with densely disposed raised striæ, which, however, are, for the most part, much more manifest in the young than in the aged specimens, where the surface, from abrasion, exhibits merely the intervening striæ. The shelve of the whorls is considerable, that is to say, they are much broader below than above; they are flattish, or plano-convex, and never much rounded. The proportion of body to spire is very variable; occasionally they are almost equal; in the produced form the dorsal length is in general as two to one; in the globular form the spire hardly occupies more than a fourth of the entire length. There is very often, especially in the more elongated specimens, a slight disposition to retusion beneath the suture of the body whorl. The aperture is large, ovate, disposed to obliquity, and more or less contracted posteriorly. The outer lip runs at a very acute angle to the body, and typically (in the adult) is more arcuated anteriorly than posteriorly, the base of the shell being broad in the more characteristic examples. The

pillar lip is broad, plano-convex, or flattened (not retuse), and white; it is not particularly thickened at its union with the outer lip; its free edge is moderately concave, its inner, or attached margin is greatly arcuated. The throat is smooth, and usually of a chocolate-brown; more rarely the entire mouth is white. The larger of the specimens we have delineated is fully the average size of fine individuals. As a general rule, it may be remarked that in the banded varieties of this and *rudis*, the coloring matter is usually disposed in narrow rings in the former, in broad zones in the latter. The outer lip, in the present species, is more frequently margined internally with the darker external coloring; in *rudis* it is more apt to be pallid, or tinged with orange-yellow.

The animal above is of a general dark hue, arising from close-set brownish-black linear markings on a yellowish or tawny ground. The lanceolate tentacula are irregularly ringed with these markings, as is the muzzle also. The operculigerous lobe is rounded, pale, and tawny, with few markings. The sole of the foot is yellowish white. Lovèn describes the tongue as having broad and quadrate central teeth, with strongly inflexed apices, consisting of a cordate central lobule, flanked by obtuse denticulations on each side; the uncini are nearly all alike, thick, and have unequally lobed and toothed apices. (*Forbes* and *Hanley.*)

Halifax (*Willis*).

Littorina palliata.

FIG. 167.

Shell small, globular-ovate, thick, smooth; spire small and depressed, generally of one color, or variegated with bands and spots; aperture rounded, outer lip sharp, pillar widely flattened.

Turbo palliatus, SAY, Journ. Acad. Nat. Sc. ii. 240; ed. BINNEY, 82.
Turbo neritoides? LIN. Syst. 1232. — CHEMN. Conch. v. 234, t. 185, fig. 1854.
Littorina neritoides, DE KAY, N. Y. Moll. 105, pl 6, figs. 109–111.
Littorina littoralis, FORBES and HANLEY. — STIMPSON, Shells of New England, 33.
Littorina palliata, GOULD, Inv. 1st ed. 260, fig. 167. — STIMPSON, Check Lists, 5.

Shell semi-globular, solid, smooth, and shining, with very faint revolving lines, and lines of growth; color variable, white, yellow, orange, olive, slate, and brown; usually of a single color, but often striped, banded, or spotted in various ways with darker and lighter colors; whorls four, the last very large, and the others scarcely rising above it; suture faintly marked, scarcely denoting the limits

of the whorls; aperture nearly circular, the lip bevelled within to a sharp edge; the pillar margin broadly flattened and white, continuous with the outer lip; color of the interior corresponding to the exterior color; operculum horny, semi-heart-shaped, smooth, sub-spiral. Length, eight tenths of an inch; breadth, nine tenths of an inch; divergence, eighty-five degrees.

Fig. 578.

L. palliata.

Found along the whole coast. Their resorts are usually exposed to the open sea. They are found on rocky shores in great abundance, and at low tide are easily obtained from the rocks and rock-weed, to which they cling, and on which they are seen in rapid motion.

The animal has the head orange, darker above, and the foot of a drab or cream color.

The varieties of coloring are innumerable; combining the colors above-mentioned in every possible manner. They consist principally, however, in bands of different widths, from hair lines, up to a third of the width of the body whorl; but the surface is sometimes reticulated, or marked with triangular spots.

The great points of distinction are the smooth surface, short, depressed spire, broadly flattened pillar, and, above all, the orange-colored head of the animal.

Its proportions vary with its age. While young the aperture is not much longer than the spire, but at maturity it is seven eighths of the length of the shell.

This shell would by many be considered the same as the *Turbo neritoides* of authors. It may be the *T. neritoides* of Linnæus, but not of Férussac and Lamarck. I have sent our shells to Mr. Sowerby and Dr. Lovèn, who are of the opinion that they are distinct. To some of the small European specimens parallels might be produced from our largest ones; but in general the spire of our shell is less depressed, has no decided angle bounding the flattened spire, and it is less narrowed forwards. Mr. Sowerby sent a shell labelled *Litt. expansa*, Brown, from the Frith of Forth, which much more closely resembles our shell. Dr. Lovèn has given to a dirty olive-colored shell from the coast of Norway the name of *L. squalida;* but it is precisely the same as similarly colored shells of this species. As there is still so much cause for doubt, it seems better, for the present at least, to retain Mr. Say's specific name.

Halifax to Labrador (*Willis*); Beauport, fossil (*Dawson*).

Littorina irrorata.

Turbo irroratus, SAY, BINNEY's ed. 81; Journ. Acad. Nat. Sc. ii. 239 (1821).
Phasianella sulcata, LAMARCK ?
Littorina irrorata, STIMPSON, Check Lists, 5.

Shell thick, greenish, or pale cinereous, with numerous revolving, elevated, obtuse, equal lines, which are spotted with abbreviated brownish lines; suture not indented; spire acute; labium incrassated, yellowish-brown; labium within white and thick, at the edge thin, and lineated with dark brownish; throat white; columella with an indentation; operculum coriaceous. Length, four fifths of an inch.

Fig. 579.

L. irrorata.

This has the general appearance of *Turbo littoreus*, but is sufficiently distinct by the above characters; the calcareous deposit on the labium is obvious.

An inhabitant of our estuaries of the Middle and Southern States. I have found them on the eastern shore of Maryland, and on the coast of Carolina, Georgia, and Florida; and my brother obtained a specimen on the coast of New Jersey, of the length of one inch and one tenth nearly. Mr. Cuvier would place this shell in the genus *Paludina*. (*Say.*)

Connecticut (*Stimpson*).

FAMILY SCALARIIDÆ, BROD.

SHELL without plaits on the pillar; margins of the aperture circularly united.

Genus SCALARIA, LAM. 1801.

SHELL turreted, spire long, composed of rounded, sometimes separated whorls, crossed by elevated ribs; aperture oval; lip continuous, reflected.

Scalaria Nov-Angliæ.

Shell white, whorls convex, and barely in contact; ribs numerous, slender, unequal, and with numerous, fine, revolving lines in the intervening spaces; umbilicated.

Scalaria Nov-Angliæ, COUTHOUY, Bost Journ. Nat. Hist. ii. 96. pl. 3, fig. 5. — GOULD, Inv. 1st ed. 248. —SOWERBY, Thes. pl. 35, fig. 112. — STIMPSON, Check Lists, 5.

Shell turreted, elongated, thin, of a glossy white color, with here and there an irregular rusty blotch; whorls ten, cylindrical, barely touching each other, crossed by eleven somewhat oblique, delicate bars, of a pure white color, three or four of which, on the lower whorls, are more robust than the rest; the bars do not cross the sutures, and each has a little spine at its posterior termination. The space between the ribs is thickly marked with very fine revolving lines, which are also crossed by still finer ones; aperture nearly circular, bordered by a robust rib, with a spine like the others, flattened so as to form a blunt angle at its anterior portion, and partially concealing a small umbilicus. Length, seven tenths of an inch; greatest breadth, one fourth of an inch.

Only one specimen has as yet been found, and this was taken from the stomach of a fish caught off Cape Ann, by Mr. Couthouy.

It very much resembles *S. multistriata*, Say, but that shell is described as imperforate, whereas this has a small umbilical opening; and no mention is made of the ribs being crowned by a spine. In general form it is also like *S. clathrus*, but that is imperforate, and is smooth between the ribs. To the *S. mucronata*, Risso, it is also closely allied.

Scalaria lineata.

Shell conical, white, with eight whorls, traversed by sixteen to eighteen delicate ribs, and the lower one by a revolving, raised line and one or more brownish bands; aperture oval; lip strong; umbilicus none.

Scalaria lineata, Say, Journ. Acad. Nat. Sc. ii. 242; Amer. Conch. pl. 27; ed. Binney, 83, 180. — Gould, Inv. 1st ed. 250. — De Kay, N. Y. Moll. 126, pl. 6, fig. 125. — Sowerby, Thes. Conch. 101, pl. 23, figs. 19–21. — Stimpson, Check Lists, 5.

Shell elongated-conical, pointed, white or tinged with brownish; whorls eight, rounded, not disjoined, but defined by a well-impressed suture; about sixteen to eighteen very delicate and slightly raised longitudinal ribs, not crossing the suture, traverse each one; intervening spaces smooth; a raised line or rather step, originating from the junction of the lips, revolves on the lower whorl, and defines the upper edge of a reddish-brown revolving band; another fainter band is usually seen just below the suture. Aperture sub-oval, bordered by a strong, rounded lip, which is a little expanded at the anterior angle. Umbilicus none. Length, about half an inch; breadth, one fifth of an inch; divergence, thirty-six degrees.

Fig. 530.

S. lineata.

Found by Mr. C. F. Shiverick, at New Bedford and vicinity. Buzzard's Bay, southwards (*Stimpson*).

It differs from *S. Nov-Angliæ* in its more robust and firm structure, its more numerous ribs, raised shoulder, and bands on the lower whorl, its absence of umbilicus and revolving lines, &c. It belongs to the South, and is not uncommon there. Mr. Say speaks of it as subject to considerable variety in the size of the ribs, the breadth of the colored bands, &c.

Scalaria multistriata.

Shell white; spire acute; whorls eight; ribs numerous, the spaces between them marked with fine revolving lines; umbilicus none.

Scalaria multistriata, Say, Amer. Conch. pl. 27. — Sowerby, Thes. 108. — De Kay, N. Y. Moll. 126. — Stimpson, Check Lists, 5.

Shell rather small, solid, white, acutely conic; whorls eight, very convex, in firm contact, but well defined by the suture; ribs numerous, varying in number from fourteen to twenty, equidistant, and moderately elevated, simple, erect, rounded at edges; spaces between them marked with numerous fine revolving lines. Aperture rounded-ovate, more than one fourth the length of shell, margined by a rib; pillar lip thick and rounded; umbilical opening none. Length, half an inch; breadth, eight twentieths of an inch; divergence, thirty degrees.

Fig. 581.

S. multistriata.

Two small specimens, which I think must be regarded as of this species, were found by Mr. Shiverick, outside of Dartmouth Harbor. Buzzard's Bay.

They vary in some respects from the description of Mr. Say. The number of whorls is only seven, and of ribs thirteen. But ours are small specimens, less than one fourth of an inch in length; and Mr. Say gives only sixteen ribs in his description, whereas an undoubted specimen before me has as many as twenty. The specific character seems to consist in the revolving lines between the ribs, and the destitution of an umbilicus. In this last respect it differs from *S. Nov-Angliæ*, while it corresponds with that shell in the first character, and in its general outline. Other and probably larger specimens will be found, and all doubts may thereby be removed. Should it prove a distinct species, Professor Adams has proposed for it the name of **S. pulchella.**

Scalaria Grœnlandica.

FIG. 170*.

Shell elongated, regularly tapering to a point, of a livid color; whorls ten, in close contact, moderately convex, and traversed by flattened white ribs, the intervening spaces with distant, coarse, revolving lines; no umbilicus.

Turbo clathrus Grœnlandicus, CHEMN. Conch. xi. t. 1878, 1879.
Scalaria planicosta, KIENER, Iconog. (*Scalaria*), pl. 7, fig. 21.
Scalaria subulata, COUTHOUY, Bost. Journ. Nat. Hist. ii. 93, pl. 3, fig. 4. — DE KAY, N. Y. Moll. 125, pl. 6, fig. 124.
Scalaria Grœnlandica, SOWERBY, Thes. 101, pl 34, figs. 105, 106. — GOULD, Inv. 1st ed. 249, fig. 170*. — STIMPSON, Check Lists, 5.

Shell turreted, long, and regularly tapering to a fine point, of a dead bluish-white or livid-brown color; whorls ten, rather flattened, barred with eight to fifteen stout, flattened, oblique white ribs, some of which are apparently double; ribs not terminating abruptly, but bending and flowing along the sutural space to the preceding ones; the intervening space is marked by six or eight coarse, rounded, equidistant ridges and revolving lines; a single one, nearly as elevated as the ribs, revolves from the upper angle of the aperture; aperture nearly round, bordered by a rib; left lip a little expanded, and projecting into a perceptible angle in front. Length, one inch; greatest breadth, seven twentieths of an inch; divergence, thirty-four degrees.

Fig. 582.

S. Grœnlandica.

Found thrown upon Nahant Beach, and taken from fishes caught in Massachusetts Bay, and at the Grand Banks, abundantly. Eastport, dead (*Cooper*); off Egg Rock, seventeen fathoms (*Haskell*); Nova Scotia (*Willis*); fossil, Beauport (*Dawson*). Mr. Couthouy found one alive at Phillips's Beach, the animal of which he describes nearly as follows: —

Animal yellowish-gray, thickly and irregularly marked with dull whitish spots, most conspicuous on the sides of the neck; foot short, thick, and nearly quadrangular; head elongated, rounded superiorly, not separated from the neck by any distinct line; tentacula two, about an eighth of an inch long; eyes small, black and shining, at the outer base of the tentacula; mouth rather large, rounded, corrugated; operculum horny, strong, opaque, of few turns. It was sluggish in its movements, and fed eagerly upon fresh beef, especially if somewhat macerated.

Two imperfect shells in my possession, which I had supposed to

be *S. Turtonis*, I am now satisfied belong to this species. They are three or four times as large as the shells observed by Mr. Couthouy, and ordinarily found. But by comparison with specimens of *S. Turtonis* sent me by Mr. Sowerby I find the color different, and the brown bands entirely wanting in our shell. In *S. Turtonis* the whorls are more numerous, and more convex; the ribs are more delicate, and the intervening revolving lines are more numerous and far more delicate. Moreover, Mr. Sowerby, in indicating it to be the *Turbo clathrus Grœnlandicus* of Chemnitz, and hence called *Scalaria Grœnlandica*, observes, that it sometimes attains the length of two inches and a half. On account of the flatness of the whorls, and the suture being partially filled by the ribs, this shell has the outline of a *Terebra*.

Family TURRITELLIDÆ, Clark.

Shell spiral, many-whorled, or tubular; aperture simple in front.

Genus CÆCUM, Fleming. 1824.

Shell when young discoidal, when adult decollated, tubular, cylindrical, arcuated; aperture round, entire; apex closed by a mammillated septure, marking the point at which the original spire has been cast off.

Cæcum pulchellum.

Cæcum pulchellum, Stimpson, Proc. Bost. Soc. iv. 112 (1851); Shells of New England, 36, pl. 2, fig. 3; Check Lists, 5.

Shell in its adult state clavate, one tenth of an inch in length and twenty-five thousandths of an inch in breadth at its broadest part, arcuated, contracted at both extremities, and having a somewhat angular appearance at its outer or dorsal outline, which is much longer than the inner. It is somewhat thick and strong, of a pale yellowish-brown color, and sculptured with about twenty-five strong rounded ribs, broader anteriorly, but narrower posteriorly, than their interspaces, not projecting sharply beyond the outline of the shell, but giving it a waved appearance. Operculum multi-spiral, of about eight volutions, corneous and concave on the outer surface.

The animal agrees nearly with the English species, *C. trachea*, as described by Mr. Clark. The head projects but little in advance of the foot, which is short. The muzzle is cleft and transversely wrinkled, and has two black spots above just in front of the tentac-

ulæ which are thick, curved, and covered with large cilia. The eyes are conspicuous, black, oval, and situated at nearly the middle of the bases of the tentaculæ, a little toward the inner sides. The operculigerous lobe projects a little beyond the operculum.

Fig. 583.

C. pulchellum.

In keeping alive several individuals of this species from April to November, I observed the following stages of growth: First. A slender, thin, arcuated form with few distinct ribs. Second. The anterior half of this form, left by the decadence of its posterior half, with a part of the growing adult shell. Third. The adult form. Thus septa would appear to be thrice formed.

This species inhabits the laminarian zone in New Bedford Harbor, where it was dredged adhering to groups of *Vermeti* (*Stimpson*).

Genus VERMETUS, Adanson. 1757.

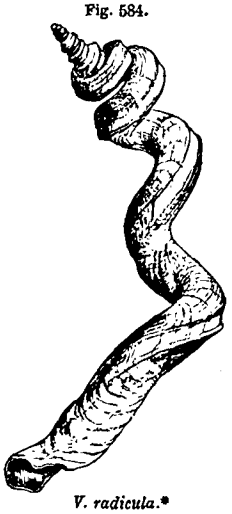
Shell tubular, spiral at the apex, irregularly and loosely twisted towards the aperture; operculum horny.

Vermetus radicula.

Shell conic-tubular; usually many tubes are intertwined into a group; unequal striæ run the whole length of the tube.

Vermetus lumbricalis, Gould, Inv. 1st ed., not of Lam.
Vermetus radicula, Stimpson, Shells of New England, 37; Check Lists, 5.

Fig. 584.



*V. radicula.**

Shell consisting of a long, rough, ash-colored, conical tube, marked with numerous, unequal, raised lines along its whole length. At the pointed end is a spire of eight or ten closely connected whorls, upon each of which are two sharp, elevated ridges. This portion usually lies in a horizontal direction, and is attached by one side to some foreign body. The coil then becomes ascending and lax until it can barely be called tortuous. The aperture is circular, with a sharp, simple edge, and is closed by a horny operculum, having a central nucleus, and concentric elements.

The length of the closely spiral portion is from half an inch to an inch; it is then continued indefinitely. Some of my specimens

* I am indebted to E. R. Mayo, Esq. for the opportunity of figuring a fine specimen from Buzzard's Bay. — W. G. B.

must be eight or ten inches in length. Diameter of aperture about one fourth of an inch. It is very seldom that one specimen is found by itself; numbers are usually grouped and intertwined with each other.

A very fine group was hooked up by a friend in New Bedford Harbor, containing not less than fifty individuals, inseparably intertwined. The living animals then occupied them. Professor Adams has also found small ones in the same region. Several specimens of *Cumingia tellinoides* were entangled within the folds, and in one of the tubes was a *Crepidula plana*. In the case of this shell we have the paradox of the apex or commencement of the shell being situated beneath the base.

Genus TURRITELLA, Lamarck. 1799.

Shell turreted, elongated, spirally grooved, pointed; aperture entire, rounded; lips disjoined posteriorly; operculum horny.

Turritella erosa.

Shell elongate-turreted, pale brown, composed of about ten smooth, flattish whorls, sloping above to the suture, and grooved with from three to five obtuse, revolving furrows.

Turritella erosa, Couthouy, Bost. Journ. Nat. Hist. ii. 103, pl. 3, fig. 1. — Gould, Inv. 1st ed. 267. — Stimpson, Check Lists, 5. — De Kay, N. Y. Moll. 113, pl. 6, fig. 122.

Shell elongated-conical, turreted, pale horn colored, with a light reddish-brown epidermis; whorls about ten, flattish, smooth, sloping towards the suture, so that each whorl seems a little shelving over the succeeding one, and furrowed with from three to five abrupt, revolving grooves, nearly as wide as the spaces between them. From five on the largest whorl, the number goes on diminishing above; the whorls at the apex are usually broken off, and much of the summit is a good deal eroded. Lines of growth are quite conspicuous in the grooves, but scarcely perceptible elsewhere; aperture nearly circular; lip sharp, meeting the prolonged pillar, so as to produce a partial angle; operculum horny, multi-spiral. Length four fifths of an inch; breadth, three tenths of an inch.

Fig. 585.

T. erosa.

Found in the stomachs of fishes caught in Massachusetts Bay. It is usually found either incomplete, or much defaced and broken.

I have seen but one specimen containing the animal. Eastport (*Cooper*); Banks (*Willis*); fossil, Beauport (*Dawson*).

It is quite different from any described species, unless it be *T. Virginiana* of Lamarck. His description is not sufficiently definite to identify his shell with ours, and the character "*basi annulo griseo-violacescente notatâ*," I have never found upon it. It bears a distant resemblance to the old *Turbo terebra* of English authors, but it does not slope to a point so rapidly, and the sculpture seems to be from grooves, and not from raised lines as in *T. terebra*.

Turritella reticulata.

Shell turreted-subulate; whorls twelve, convex, with longitudinal folds and transverse striæ; suture strongly impressed; aperture sub-orbicular.

Turritella reticulata, MIGHELS and ADAMS, Bost. Journ. iv. 50, pl. 4, fig. 19 (1842). — STIMPSON, Check Lists, 5.

Fig. 586.

T. reticulata.

Shell turreted, very slender, of a dingy white or ash color; whorls eleven to twelve, convex, distinctly, though somewhat irregularly plicate longitudinally, with from three to five delicate, impressed, revolving striæ on the five lower whorls; from and above the fifth whorl the transverse striæ gradually diminish in number, until they wholly disappear on the upper two or three whorls. The whole surface of the shell has a reticulated appearance. Suture well impressed; aperture orbicular; labrum thin; operculum horny. Length, seven tenths of an inch; breadth, two tenths of an inch; divergence, twenty degrees.

Bay Chaleur, in the Gulf of St. Lawrence; taken from the stomachs of codfishes by Mr. Foster, fisherman, in the summer of 1841, to whom we are indebted for specimens.

This species is allied to *T. erosa*, Couthouy, but is easily recognized by the longitudinal ribs, and by its more slender form. (*Mighels* and *Adams.*)

Fishing Banks (*Willis*).

Turritella costulata.

Shell whitish, with delicate transverse striæ; whorls ten, the upper ones subplicate, the last two rather smooth; body whorl sub-carinated; aperture subovate, produced anteriorly.

Turritella costulata, MIGHELS and ADAMS, Bost. Journ. Nat. Hist. iv. 50, pl. 4, fig. 20 (1842). — STIMPSON, Check Lists, 5.

Shell whitish, translucent; whorls nine or ten, nearly flat, or very slightly convex; suture well impressed; last two whorls nearly smooth; the others longitudinally plicate, with microscopic transverse striæ; last whorl sub-carinate; aperture rather less than one fourth the length of the shell, sub-ovate, produced anteriorly. Length, seven tenths of an inch; breadth, twenty-three hundredths of an inch; divergence, twenty-two degrees.

Fig. 587.

T. costulata. Enlarged.

Casco Bay; taken from the stomach of a haddock in the summer of 1841.

Although only a single specimen has been obtained, its characters are so obvious that we have not hesitated to describe it. It has no analogue on our coast, to our knowledge; it, however, resembles a very much enlarged *T. interrupta*, Totten. It is in the cabinet of J. W. Mighels. (*Mighels* and *Adams.*)

Turritella acicula.

Turritella acicula, Stimpson, Bost. Pr. iv. 15 (1851); Shells of New England, 35, pl. 1, fig. 5; Check Lists, 5.

Shell small, turreted, subulate, white, thin; whorls ten, very convex, longitudinally striate and bound with transverse ribs, of which three are stoutest; aperture rounded, effuse anteriorly; peristome acute. Length, twenty-two hundredths of an inch; breadth, eight hundredths of an inch.

Fig. 588.

T. acicula. Enlarged.

This species is distinguished from the young of *T. erosa* by its much more convex whorls and prominent ribs. The operculum appears not to be fimbriated at its edges.

This species has been taken from fishes caught off Lynn (*Tufts*), also off Cape Ann; and I have taken several from the stomachs of haddock caught in about twenty fathoms, off Marshfield. Cape Cod to Grand Manan (*Stimpson*).

Family CERITHIIDÆ, Flem.

Shell spiral, many-whorled; aperture more or less channelled in front; outer lip often expanded in the adult.

Genus APORRHAIS, Aldrovandus.

Shell turreted, spire long; aperture long and narrow, terminating in a straight canal in front, and in a channel running up the spire posteriorly; outer lip thickened and widely dilated.

Aporrhais occidentalis.

FIG. 205.

Shell spindle-shaped, the outer lip expanded into a broad, thick wing; whorls convex, with numerous waving, longitudinal folds, and regular, conspicuous, revolving lines.

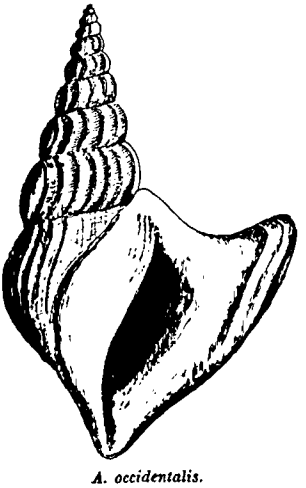
Rostellaria (Aporrhais) occidentalis, BECK, Lyell's Catal. of Fossils of St. Lawrence Bay, in Geolog. Trans. — GUERIN, Mag. de Zool. May, 1836, pl. 72. — DE KAY, N. Y. Moll. 155, pl. 8, fig. 177. — GOULD, Inv. 1st ed. 298, fig. 205.

Aporrhais occidentalis, SOWERBY, Thes. 21, pl. 5, fig. 2. — REEVE, Conch. Syst. ii. 202, pl. 246, fig. 3. — STIMPSON, Check Lists, 5.

Chenopus occidentalis, CHENU, Man. i. 262, fig. 1647. — LAMARCK, An. sans Vert. iv. 658.

Shell thick but light, of a livid or bluish-white color; excluding the wing, it is spindle-shaped, composed of eight or nine moderately convex whorls, with numerous smooth, rounded, crescent-shaped folds, which scarcely reach the well-marked sutures; on the largest whorl there are about twenty-five folds, and on the last but one they become closer and fainter, till they finally disappear on the back; two or three whorls at the pointed apex are also destitute of folds; beautiful revolving lines, of uniform size and distance, also ornament the shell; aperture crescent-shaped, independent of the wing; this arises a little above the suture of the preceding whorl, and passes off from the spire at an angle of about one hundred and twenty degrees, to a distance equal to the breadth of the lower whorl; after forming somewhat of a spur at the posterior and outer angle, it advances, smooth, and very thick, at nearly a right angle, in a straight line nearly an inch, then, forming an obtuse angle, passes obliquely forward to the pointed termination of the columella, forming with it a short, shallow, and oblique canal; pillar lip smooth and rounded, convex above, and concave below; throat livid; a thick, dusky epidermis. Length, two and one fourth inches; breadth, one and a half inches; divergence, forty degrees.

Fig. 589.



A. occidentalis.

Tips of this shell, some of them, however, wanting nothing but the expansion of the lip, are all that have yet been found in our Bay,

and along the coast of Maine. Complete shells are found in fishes taken at the Newfoundland Banks. Sable Island (*Willis*). Imperfect specimens occasionally on Nahant Beach (*Haskell*); Eastport, twenty fathoms, alive (*Cooper*); Portland, Labrador, Sable Island (*Dawson*); Bay of Fundy (*Willis*); St. Anne (*Bell*); fossil of Tertiary Bay, Labrador.

It is a very extraordinary shell, resembling, in its expansion without digitations, the fossil species *macroptera*, of which the genus *Hippocrene* has been formed. The animal is not known, but from the alliance of the shell to the *Aporrhais pes-pelecani* it probably belongs to the same genus. As this cannot now be settled, it is better to leave it still in the genus *Rostellaria*, from which the *pes-pelecani* has been separated, on account of a difference in the animal.*

The lip is very remarkable, and very much resembles the lip of *Strombus tricornis*.

Genus BITTIUM, (Leach) Gray. 1847.

Shell turreted, many whorled, granular, often with irregular varices; aperture with a slight canal in front, not produced or recurved; inner lip simple; outer lip acute, not reflexed or expanded.

Bittium nigrum.

Fig. 183.

Shell small, ashy or slate-colored, covered with a fine network of elevated lines; aperture rounded; canal merely an oblique fissure.

Cerithium reticulatum, Totten, Sillim. Journ. xxviii. 352, fig. 8.
Pasithea nigra, Totten (the young), Sillim. Journ. xxvi. 369, pl. 1, fig. 7.
Cerithium Sayi, Menke; Gould, Inv. 1st ed. 278, fig. 183. — De Kay, N. Y. Moll. 128, pl. 8, fig. 167. — Stimpson, Shells of New England, 37.
Bittium nigrum, Stimpson, Check Lists, 5.

Shell small, elongated-conical, somewhat turreted, the upper whorls of a blue-black or slate color, and two or three of the lower ones usually much lighter, white, or ash gray; whorls six or eight, forming an elevated conical spire; surface covered with a granular network from the crossing of slightly elevated, rounded folds or ribs, and elevated spiral lines; of the ribs there are about twenty, which vanish on the lower half of the anterior whorl; of the spiral

* It is now universally removed from *Rostellaria*. — W. G. B.

lines there are about six on the lower whorl but one, five on the next above, and so on; besides these, on the anterior whorl are about six raised revolving lines about the base, partially granulated; suture distinct, with the series of granules next below it rather largest, so as to form a slight shoulder; aperture oblique, rounded, and flaring, about one quarter the length of the shell, broad anteriorly; outer lip sharp, modified by the revolving lines; inner margin angular-concave, with a plate of enamel, not pressed close upon the body whorl, uniting the two lips above, and forming an umbilical fissure below; canal a mere oblique fissure or notch, not prolonged forward so far as the lip; operculum horny, ovate, apex at the centre of the broader part concave outwardly, with four or five spiral turns. Length, three tenths of an inch; breadth, one tenth of an inch; divergence, twenty-eight degrees.

Fig. 590.

B. nigrum.

Found very abundantly at Nantucket, Martha's Vineyard, New Bedford, &c. It has not been found to my knowledge within or to the north of Cape Cod. Pictou (*Dawson*); Halifax (*Willis*). Its proper station is on sea-weed, stones, and marine bodies, about low-water mark. The young are sometimes seen in such numbers as to conceal the sand beneath them. These are always reddish-black, with a very different aperture. It seems not to attain its growth the first season, and the second year's growth is usually distinctly indicated by its much lighter color.

The name given by Colonel Totten, at my suggestion, is preoccupied by an English species.* Its wide expanded mouth, with scarcely anything like a canal, renders its claim to a place in the genus *Cerithium* rather equivocal. These characters, with its sculpture, distinguish the species.

Bittium Greenii.

Fig. 184.

Shell small, reddish-black, tumido-conic, elongated, with longitudinal ridges and revolving lines; canal very deep and very short, slightly curved.

Cerithium Greenii, Adams, Bost. Journ. Nat. Hist. ii. 287, pl. 4, fig. 12. — Gould, Inv. 1st ed. 279, fig. 184.
Bittium Greenii, Stimpson, Check Lists, 5.

Shell small, elevated-conic, sloping somewhat abruptly above the middle, to a prolonged, pointed apex; whorls ten or twelve, flat-

* In the genus *Cerithium*. — W. G. B.

tened, traversed by numerous folds or ridges, of which there are from twenty to twenty-five on the lower whorl, crossed by three revolving impressed lines, producing three series of granules, of which the lower one is largest, so that the base of each whorl seems to jut over the one below it; the upper series is nearer to the middle one than that is to the lower one, and soon disappears on the upper whorls; then the middle one vanishes, and finally the lower one, so that the whorls at the apex are either smooth or merely wrinkled; two black threads, emerging from the aperture, revolve around the base of the shell; suture distinctly marked; aperture about one eighth the length of the shell, nearly circular, terminating in a deep, very short canal, partly closed over by the lips; outer lip sharp, notched, and a little everted; pillar twisted, regularly arched above. Length, one fifth of an inch; breadth, one twentieth of an inch; divergence, thirty-five degrees.

Fig. 591.

B. Greenii.

Found by Professor Adams in Dartmouth Harbor, clinging to marine plants, a few feet below low water, with other species. Boston Harbor, southwards (*Stimpson*).

This little shell would hardly be distinguished when mixed with the young of *B. nigrum*. Its color is the same, and it is not unlike it in marking. From the full-grown shell it is readily distinguished by its bulging shape, the apparent jutting of one whorl over another, its smaller size, and by its deeply notched canal.

Genus TRIFORIS, Desh. 1825.

Shell turreted, sinistral; aperture round, produced anteriorly into a closed, tubular canal, sometimes with a posterior, closed canal.

Triforis nigrocinctus.

Fig. 182.

Shell small, reddish-black, granulated; whorls twelve, reversed; aperture small; beak short and recurved.

Cerithium nigrocinctum, Adams, Bost. Journ. Nat. Hist. ii. 286, pl. 4, fig. 11. — Gould, Inv. 1st ed. 277, fig. 182.
Triforis nigrocinctus, Stimpson, Check Lists, 5.

Shell small, conico-cylindrical, blackish-red, with three revolving series of rounded, bead-like granules, formed by numerous ribs or

folds, which are cut by two deep, revolving lines into equal parts; the middle series is wanting on the posterior fifth of the shell, and the upper series is smaller than the lower, at last disappearing also; whorls twelve or more, reversed, convex, forming an elongated, acutely pointed spire, somewhat swelling in its outline; suture broad, divided by a somewhat granular, black ridge, which, in the progress of growth, changes its place, and forms the lower edge of the last whorls; this ridge retains its color when the rest of the shell fades, and then becomes a conspicuous belt; an impressed line each side of the sutural ridge, and two others emerging from the aperture, revolve about the base of the anterior whorl; aperture oval, about one fifth the length of the shell, ending in a twisted canal about one third as long as the aperture; outer lip sharp, notched by the revolving lines; inner lip deeply arched, the pillar twisted, black, and projecting. Length, three tenths of an inch; breadth, three fortieths of an inch; divergence, twenty-three degrees.

Fig. 592.

T. nigrocinctus.

Found by Professor Adams, in Dartmouth Harbor, clinging to sea-weed, a few feet below low-water mark.

It is at once distinguished by its black color, slightly tinged red, and its reversed whorls. It is closely allied to the *Murex adversus*, Montagu, but is probably different, as that shell has the middle series smaller, and the canal straight. It is also of a lighter color.

The whole shell, when fresh, is of a uniform color, so that the dark revolving line at the suture is scarcely distinguishable, instead of something evident, as we should expect from the name. The specific appellation, on this account, is not well chosen. In some lighter colored individuals, however, the zone is very apparent.

Family PYRAMIDELLIDÆ, Gray.

Shell turreted; aperture entire or not produced into a canal in front; columella plaited.

Genus ODOSTOMIA, Fleming. 1828.

Shell conical, elongated; aperture ovate; lips disunited posteriorly, and sometimes produced anteriorly; pillar with a tooth-like fold; operculum horny, sub-spiral.

Odostomia producta.

FIG. 175.

Shell small, conic-cylindrical; whorls eight, nearly flat; epidermis light brown; columella flexuous.

Jaminia producta, ADAMS, Bost. Journ. Nat. Hist. iii. pl. 3, fig. 8.
Chemnitzia producta, STIMPSON, Shells of New England, 41.
Odostomia producta, GOULD, Inv. 1st ed. 270, fig. 175. — STIMPSON, Check Lists, 5.

Shell small, elongated, conic-cylindrical, very slender, composed of eight or more flattish whorls, separated by a well-impressed suture; tip blunted, as if one or more whorls were removed; surface faintly marked by lines of growth, and covered with a dusky, horn-colored epidermis; occasionally an indistinct revolving line may be seen on two or three of the lowest whorls; aperture about one fourth the length of the shell, ovate, regularly rounded in front, the pillar margin modified by the rising and revolving of the outer lip around it, so as to produce a partial fold. Umbilicus none. Operculum thin, horny, spiral, apex at one side. Length, one fourth of an inch; breadth, one fifteenth of an inch; divergence, twelve degrees.

Fig. 593.

O. producta.

Found by Professor Adams, in September, 1839, near high-water mark, in a cove on the east side of Fairhaven.

It is distinguished from *O. bisuturalis* by the same characters as *O. fusca* is. To this last it is very closely allied; and, as neither of them has any very prominent peculiarities, it may not be possible to make apparent in words distinctions which are quite obvious to the eye. This is, however, a much more slender shell than *O. fusca*, has one or more additional whorls, a much lighter colored epidermis, less convex whorls, and no approach to an umbilicus. While the two shells are about equal in length, the lower whorl of *O. producta* is not more than two thirds as large as that of *O. fusca*, so that it has a very much more slender and cylindrical form; and this it is which most readily strikes the eye on comparison.

This does not belong to the genus *Jaminia* of Leach; and Brown has given us no characters for the genus, as he employs it.

Odostomia fusca.

FIG. 176.

Shell small, elevated-conical, rather blunt at tip, and sub-umbilicated; color dark brown; aperture broadly ovate.

Pyramis fusca, ADAMS, Bost. Journ. Nat. Hist. ii. 282, pl. 4, fig. 9.
Jaminia fusca, ADAMS, Ibid. iii. 337.
Odostomia fusca, GOULD, Inv. 1st ed. 270, fig. 176. — STIMPSON, Check Lists, 5. — DE KAY, N. Y. Moll. 116, pl. 36, fig. 342.
Chemnitzia fusca, STIMPSON, Shells of New England, 41.

Shell small, thin, elongated-conical, rather blunt, or worn off at apex, a smooth and glossy violet-brown epidermis covering it, through which the lines of growth are perceptible; whorls six, probably eight when the tip is entire; slightly convex, regularly tapering, and separated by a well-defined suture, and sometimes by a revolving line just below it, so that the suture seems double; aperture ovate, widened at the middle by a twist of the pillar lip, acutely angular behind; simple and sharp, widely and regularly rounded in front; it ascends upon the columella, and forms an oblique, nearly transverse ridge, as it revolves within the aperture, and so deep as to be nearly concealed; space between this fold and the posterior angle of the aperture joined by a thin plate of enamel; an umbilical indentation about the middle of the left lip. Length, five twentieths of an inch; breadth, three fortieths of an inch; divergence, twenty-six degrees.

Fig. 594.

O. fusca.

This shell was first found by Professor C. B. Adams, at New Bedford, clinging to planks, not far above low-water mark, and from him I received my specimens. They have since been found at Dartmouth and Tiverton.

Compared with *O. bisuturalis*, with which shell it is most likely to be confounded, it is shorter and more blunt-pointed; the whorls are more flat, and the lowest in exact keeping with the rest; the color very much darker; the aperture is broader and modified by a twist of the left margin, without any prolongation at base. The turning of the lip into the aperture forms a fold, which, in some specimens, is not seen without looking far within; in others it is quite conspicuous, and in others it is even divided by a furrow into two folds. The figure and description in the "Boston Journal of Natural History" were drawn from specimens much smaller and less perfect than some since found; so that they are both imperfect. The spiral ridge or fold on the columella is there said not to exist at all.

These last two shells differ in some characters from the following, and perhaps belong to a different genus. The shell is thin and horny, the aperture regularly rounded in front, and the fold on the pillar inconspicuous. In the true *Odostomiæ* the shells are of a solid, ivory structure, and the lip somewhat produced in front, forming the connecting link with *Cerithium* and the *Canalifera*.

Odostomia dealbata.

Chemnitzia dealbata, STIMPSON, Proc. Bost. Soc. iv. 114 (1851); Shells of New England, 41.
Odostomia dealbata, STIMPSON, Check Lists, 5.

Fig. 595.

O. dealbata.

Shell ovate-conic, white, smooth, pellucid; whorls six, rather convex; aperture ovate, hardly effuse; furnished with a small inconspicuous fold. Length, seventeen hundredths of an inch; breadth, six and a half hundredths of an inch.

It is broader than *O. bisuturalis*, but has not so sharp an apex, and wants the revolving line; dredged in Boston Harbor, three fathoms, on a shelly bottom (*Stimpson*).

Odostomia modesta.

Chemnitzia modesta, STIMPSON, Proc. Bost. Soc. iv. 16; Shells of New England, 41.
Odostomia modesta, STIMPSON, Check Lists, 5.

Fig. 596.

O. modesta.

Shell small, conic, white, smooth; whorls four, flattened, the last medially sub-angulated; suture impressed; aperture uniplicate, sub-rhomboid. Length, fourteen hundredths of an inch; breadth, six hundredths of an inch.

This species is more angular than *O. bisuturalis*, and has no revolving line just below the suture, as in that shell. It is very like the British *O. unidentata*. It inhabits the Coralline Zone, at St. George's Banks (*Stimpson*).

Odostomia bisuturalis.

FIG. 177.

Shell small, ovate-conical, smooth, whitish; with a single revolving line below the suture; aperture oval, sub-umbilicated.

Jaminia exigua, COUTHOUY, Bost. Journ. Nat. Hist. ii. 92, pl. 2, fig. 7 (1838). — KÜSTER, 59, pl. 10, figs. 25, 26.
Odostomia exigua, GOULD, Inv. 1st ed. 272, fig. 77. — STIMPSON, Check Lists, 5.
Rissoa rupestris, FORBES, Ann. of Nat. Hist. ii. 107, pl. 2, fig. 13.
Turritella bisuturalis, SAY, Journ. Acad. Nat. Sc. ii. 244 (1821).
Chemnitzia bisuturalis, STIMPSON, Shells of New England, 42.

Shell small, ovate-conical, somewhat turreted, rather obtuse at apex, surface smooth, light green, under a brownish epidermis,

lines of growth scarcely perceptible; whorls five or six, separated by a well-defined suture; and, in most specimens, a distinct line revolves just before the suture, giving the appearance of a double suture; the lowest whorl is proportionally larger than the others, and constitutes about half the length of the shell; aperture oval, outer lip sharp and simple; pillar lip bluish-white, smooth and rounded; a transverse, white fold is formed by the turning of the lip within the shell, before which it is a little raised and turned outwards, producing an umbilical chink, and is extended so as to form a considerable projecting angle at the lower extremity; operculum horny. Length, one fifth of an inch; breadth, one tenth of an inch; divergence, twenty-eight degrees.

Fig. 597.

O. bisuturalis. 4/1

First found by Mr. Couthouy, at Chelsea, near the ferry landing, adhering to decaying wood. It has since been found in various similar situations, and under the damp portions of loose stones left on the shore at low tide.

It is distinguished from *O. trifida*, with which it would be confounded without intimate examination, by its being a less slender and pointed shell, the disproportion of the last whorl, and the greater convexity of all the whorls, and the want of two or three revolving lines so characteristic of *O. trifida*. In the latter shell the fold of the columella is oblique, and in *O. bisuturalis* it is nearly transverse. It will also be necessary to compare it with the next species. I should be disposed to regard it as the same with *Turbo unidentatus*, Montagu (Test. Brit. 324); but as it is impossible to decide on such minute species with no obvious characteristics, from description only, I must leave it unsettled.

It is almost certainly the *Turritella bisuturalis* of Say; at least, I know of no other shell which will at all answer to his description. The figure and description of *Rissoa rupestris*, Forbes, also correspond with it.

Odostomia trifida.

Fig. 179.

Shell small, acute-conic, glossy white, with numerous impressed revolving lines, of which the two uppermost, and those about the base of the last whorl, are most distinct; aperture narrow.

Actæon trifidus, Totten, Sillim. Journ. xxvi. 368, pl. 1, figs. 4, *a*, *b*.
Odostomia trifida, Gould, Inv. 1st ed. 274, fig. 179. — De Kay, N. Y. Moll. 114, pl. 8, fig. 170. — Stimpson, Check Lists, 5.

Shell elevated, pointed, smooth, and glossy, of an ivory-white color; whorls about eight, flat, separated by a sharp, slightly depressed suture, on which are from three to five revolving lines, of which the two next below, and the one immediately above the suture are most deeply sculptured; about the front of the lower whorl are usually ten or twelve very fine lines also; aperture narrow, about one third the length of the shell, acutely angular above; outer lip sharp and thin, sometimes showing within, and on its sharp edge, the impressed lines; the inner margin regularly curved; the pillar, widening and expanding a little, is produced so that an acute angle is formed by the junction of the two lips in front; about the middle of the inner margin is a single, sharp, oblique fold, formed by the revolution of the outer lip within the shell; operculum horny; apex nearly terminal, sub-spiral. Length, one fourth of an inch; breadth, one tenth of an inch; divergence, twenty-three degrees.

Fig. 598.

O. trifida. 8/1

First found by Colonel Totten on the shores of Rhode Island, adhering to *Pecten irradians*. Since then it has been found by Professor Adams among sand from New Bedford Harbor.

Lynn Harbor (*Haskell*); Buzzard's Bay to New York (*Stimpson*).

Odostomia seminuda.

FIG. 178.

Shell acute-conic, white, with coarse revolving lines, crossed on the upper whorls, and on the upper half of the lower whorl, by longitudinal lines.

Jaminia seminuda, ADAMS, Bost. Journ. Nat. Hist. ii. 280, pl. 4, fig. 13.
Odostomia seminuda, GOULD, Inv. 1st ed. 273, fig. 178. — DE KAY, N. Y. Moll. 115, pl. 8, fig. 175. — STIMPSON, Check Lists, 5.

Shell acute-conic, glossy white, translucent; whorls six or seven, convex, the upper ones and one half the lower whorl with numerous ridges or folds, crossed by three equidistant revolving lines, giving the surface a granulated appearance; at the base of the lower whorl are four more revolving lines, beginning on the middle, where the folds terminate abruptly; suture distinct, divided by an indistinct spiral ridge; aperture oval, one third the length of the shell; the outer lip very thin, and scalloped by the revolving lines; the base is prolonged into a concave angle, and rising, revolves within the shell, forming a single inconspicuous fold on the pillar. Length,

Fig. 599.

O. seminuda. 8/1

fifteen hundredths of an inch; breadth, seven hundredths of an inch; divergence, thirty degrees.

First found by Professor Adams, at Dartmouth, on valves of *Pecten irradians*, taken up beyond low-water mark. Massachusetts Bay, northwards (*Stimpson*).

This shell is readily distinguished from all others found in our waters of a similar size and outline, by the sculpture of the lower whorl, the upper half of which is granulated by the decussating lines, and the lower half marked by revolving lines only. It is smaller, and less elevated proportionally than *O. trifida*. Making allowance for variations in magnifying two shells so small, this seems not to differ much from *Turbo spiralis* of Montagu (Test. Brit. 323, pl. 12, fig. 9). He neither represents nor describes any revolving lines crossing the folds; but they might possibly have been overlooked, for Fleming distinctly mentions them.

[Animal, eyes large, black; when in the water it often hangs by a mucous thread from the surface, which is attached to the posterior part of the foot; gregarious.

Odostomia impressa.

Turritella impressa, SAY, Journ. Ac. Nat. Sc. ii. 244 (1822); ed. BINNEY, 84.
Odostomia impressa, STIMPSON, Check Lists, 5.
Odostomia insculpta, DE KAY, N. Y. Moll. 115, pl. 31, fig. 297.

Fig. 600.

O. impressa.

Shell dusky, acute at the apex; volutions six, with about four acute, impressed, revolving lines; labrum not thickened, a slight indentation at its base, and a projecting angle within its middle.

Inhabits the coast of Maryland. Length, more than an eighth of an inch.

I have seen but two specimens of this species. The aperture is precisely similar to that of the preceding species, *T. alternata*. (*Say*).

Connecticut (*Stimpson*).

Genus TURBONILLA, LEACH. 1825.

SHELL slender, elongated, many whorled, longitudinally ribbed; apex of spire with persistent, embryonic, sinistral nucleus; aperture oblong or sub-quadrate, peristome incomplete; columella straight, simple, edentulate, and without a plait.

Turbonilla interrupta.

FIG. 173.

Shell small, subulate, brownish-white, reticulated with numerous ribs and revolving lines, which are interrupted by the ribs, and the faintly colored bands.

Turritella interrupta, TOTTEN, Sillim. Journ. xxviii. 352, fig. 7. — ADAMS, Bost. Journ. Nat. Hist. ii. 275. — GOULD, Inv. 1st ed. 268, fig. 173. — DE KAY, N. Y. Moll. 112, pl. 6, fig. 123.
Turbonilla interrupta, STIMPSON, Check Lists, 5.

Shell small, very slender and pointed, pale brownish-white, glossy; whorls eight or ten, slightly convex, the suture well-defined, on which are from twenty-five to thirty straight, blunt ribs, crossed by about fourteen revolving lines, which are interrupted by the ribs; these lines are arranged in pairs, but so close to each other as not always to be distinguished, and would usually be regarded as one; on the anterior half of the lower whorl the ribs vanish, and the fine revolving lines are uninterrupted. In fresh specimens may be seen a purplish band just below the suture, and on the anterior whorl two faint yellow ones; aperture about one sixth the length of the shell, ovate, sharply angular behind; outer lip sharp and simple, inner lip slightly everted. Length, one fourth of an inch; breadth, one tenth of an inch; divergence, twelve degrees.

Fig. 601.

T. interrupta.

First found by Colonel Totten in the harbor of Newport, Rhode Island; and since found by Professor C. B. Adams, in Dartmouth Harbor, by dredging below low-water mark. He has also found it in New Bedford Harbor. Four fathoms near East Boston.

It is readily recognized by its slender, pointed, glossy appearance, and its reticulated surface. Several recent and fossil species resemble it in shape and size, among which are *Turbo elegantissimus*, Montagu, *Turritella æqualis*, Say, and *T. laqueata*, Conrad.

This species does not belong to the genus *Turritella*, but will probably come under the genus *Eulima* of Risso.

Turbonilla nivea.

Chemnitzia nivea, STIMPSON, Proc. Bost. Soc. iv. 114 (1851); Shells of New England, 40.
Turbonilla nivea, STIMPSON, Check Lists. 5.

Shell aciculated, sub-cylindrical, white, shining; whorls eleven, flattened, longitudinally plicate; folds straight, interstices perfectly

Fig. 602. smooth. Length, twenty-eight hundredths of an inch; breadth, four hundredths of an inch.

T. nivea.

Animal white; head short; tentacles triangular, very broad, with the eyes at nearly the middle of their bases; foot elongated with an arcuated indentation at its anterior terminus.

This species differs from *T. interrupta* in being more slender, in wanting revolving lines, and also totally in its station, the deeper parts of the Coralline Zone. It was taken in forty fathoms, on a muddy and gravelly bottom off Grand Manan, a large island lying off Eastport, Maine, at the mouth of the Bay of Fundy (*Stimpson*).

Genus EULIMA, Risso. 1826.

Shell elongated, white, smooth, polished; spire produced, many-whorled, frequently with an interrupted varix on one side, apex acute; aperture oval, pointed behind; inner lip reflected over the pillar; axis imperforate; outer lip thickened internally.

Eulima oleacea.

Eulima oleacea, Kurtz and Stimpson, Proc. Bost. Soc. iv. 115 (1851). — Stimpson, Shells of New England, 39; Check Lists, 5.

Shell small, subulate, solid, very shining, white, marked with light brown transverse bands; whorls twelve, flattened, closely coiled; suture inconspicuous; aperture small, ovate. Length,

Fig. 603. twenty-five hundredths of an inch; breadth, six hundredths of an inch.

E. oleacea.

The animal is white, hyaline; tentacles almost joining each other at their bases, where, on the external sides, are the eyes, which may be seen through the shell, when, as is usually the case, the head does not project beyond it. Foot short, broad, slightly produced at the anterior angles; the lobe above projecting a little beyond it.

This is a very variable species, especially as regards the form and length of the aperture. Conrad has described two species from the *Miocene* of Virginia which closely resemble this. It was dredged in Buzzard's Bay, several miles from land, at the depth of eight fathoms, where the bottom is composed of a soft gray mud. (*Stimpson.*)

Genus MENESTHO, Möller. 1842.

Shell elongated, of numerous whorls; aperture short, ovate, entire in front; lip sharp, disunited behind; pillar without a fold.

Menestho albula.

Fig. 174.

Shell turreted, dingy-white; whorls eight, nearly flat, with numerous fine revolving lines; upper whorls tapering rapidly; suture distinct.

Pyramis striatula, Couthouy, Bost. Journ. Nat. Hist. ii. 101, pl. 1, fig. 6. — Gould, Inv. 1st ed. 269, fig. 174. — De Kay, N. Y. Moll. 114, pl. 8, fig. 169.
Menestho albula, Möller, Ind. Gr. 1842. — Stimpson, Check Lists, 5.
Menestho striata, Chenu, Man. i. 229, fig. 1311.
Turbo albulus, O. Fabricius, Fauna Gr. 394.

Shell elevated, obelisk-shaped, thick, bluish-white, usually having a dead, unpolished appearance; whorls seven to nine, nearly flat, distinctly separated by the suture, a few of the upper ones tapering rather suddenly to an acute point, thus giving it an obelisk shape; marked with obvious lines of growth, sometimes approaching to varices, and with from twelve to fifteen fine, regular revolving lines, diminishing in number towards the apex; aperture ovate, acute-angular behind; outer lip sharp and simple, without any sinus behind; slightly turned outwards at base, as it joins the regularly arched pillar margin. Length, twelve twentieths of an inch; breadth, seven forty-sixths of an inch; divergence, twenty-three degrees.

Fig. 604.

M. albula.

First found by Mr. Couthouy in the stomachs of fishes caught off Cape Ann. Several specimens have since been found, but it is by no means common. Banks, very rare (*Willis*); Halifax (*Willis*); fossil, Montreal (*Dawson*).

The characters of the aperture are like those of *Turbonilla interrupta;* but the exterior has a different character. Its aspect is precisely that of a shell sent me as *Monotigma*, Gray; but I cannot find the plait on the inner lip, from whence that genus derives its name.

Family VELUTINIDÆ, Gray.

Shell ear-shaped, the aperture much dilated, margins disunited posteriorly; operculum none.

Genus VELUTINA, Blainv. 1819.

Shell small, thin, sub-globose, composed of two rapidly enlarging volutions; aperture large, sub-ovate, lip thin, not joined behind; usually covered with a velvety or powdery epidermis.

Velutina haliotoidea.

Fig. 159.

Shell obliquely ovate, very fragile, consisting principally of the last of three whorls; epidermis brown, rising into regular, equidistant, spiral folds.

Helix lævigata, Lin. and English authors. — Donovan, Brit. Shells, ii. t. 105. — Montagu, Test. Brit. 382.
Helix haliotoidea, Fabr. (non Lin.) Fauna Grœnl. No. 387.
Bulla velutina, Müller, Zool. Dan. iii. t. 101, figs. 1–4.
Velutina capuloidea, Blainv. Malacol. pl. 42, fig. 4.
Velutina rupicola, Conrad, Journ. Acad. Nat. Sc. vi. 266, pl. 11, figs. 17, 18.
Galericulum lævigatum, Brown, Conch. of Great Brit. &c. pl. 38, figs. 35, 38.
Velutina lævigata, Gould, Inv. 1st ed. 241, fig. 159. — De Kay, N. Y. Moll. 154, pl. 23, fig. 254. — Reeve, Conch. Syst. ii. 17, fig. 124.
Velutina haliotoides, Stimpson, Check Lists, 5.

Shell obliquely-ovate or ear-shaped, very thin and fragile, transparent, flesh-colored, or reddish-white; whorls three, the last extremely large and distended, the others very small, turned to one side, and partly sunken within the last; suture distinct; surface faintly marked with the lines of growth, and covered with a thick brownish epidermis, which is raised at close and regular intervals into fringe-like ridges revolving round the shell; aperture ample, rounded-oval; lip extremely thin, but thickening a little as it rises upon the body of the shell; the two lips uniting behind by a plate of enamel crossing the body of the shell, which, in mature shells, renders the aperture nearly circular; interior smooth and shining. Diameter about four tenths of an inch; length a little more.

Fig. 605.

V. haliotoides.

Found among the sea-weed on the sea-beach, and in the stomachs of fishes. Mr. Conrad states, on the authority of Dr. Pickering, that it dwells on rocks, with habits like the *Patella*. But the fact of so fragile a shell being usually found entire in the stomachs of fishes rather forbids this idea. It could not be detached by them without being fractured.

This shell, as hitherto found, is extremely fragile, seeming to

consist almost entirely of epidermis, with a small deposition of calcareous matter within. The ordinary English specimens are said to be of about the size of a pea, or perhaps twice as large; but it sometimes becomes three fourths of an inch in diameter. I sent our ordinary specimens to Mr. G. B. Sowerby, who sent larger ones in return, assuring me of their identity. These differ from the shell as we find it, in being more solid, the epidermis more wrinkled lengthwise, the surface shining where this is removed, and the lowest whorl is disunited from the preceding one at the aperture. These changes may all be attributed to age. We may anticipate finding specimens of equal size here, since we have already found them four times as large as the one described by Mr. Conrad, who allows the very close affinity of his minute one to the *lævigata* of Europe.

The quoting of *Bulla velutina* by Lamarck, as a synonyme to his *Sigaretus haliotoideus*, is plainly erroneous. The *Helix haliotoidea* of Fabricius, which is the *Bulla velutina* of Müller, is not the *H. haliotoidea* of Linnæus and others; and hence the probable misquotation.

The figure in Pennant's "British Zoölogy" is poor; that of Blainville represents the common appearance when arrived at that size, the transverse wrinkles becoming more conspicuous than the revolving ones, which evidently become obsolete with age. The white zone, which he represents, however, I have never seen. Brown's figure is very good for a shell of the size, and Conrad's is sufficiently characteristic for specimens as we usually find them.

St. Anne (*Bell*); Halifax, Banks (*Willis*); Eastport, twenty fathoms (*Cooper*); Marblehead (*Haskell*); Cape Cod, northwards (*Stimpson*).

Velutina zonata.

Fig. 160.

Shell oval-orbicular, compressed, pellucid, covered with a striped, calcareous incrustation; inner lip flattened and channelled.

Velutina zonata, Gould, Inv. 1st ed. 242, fig. 160. — De Kay, N. Y. Moll. 154, pl. 23, fig. 253. — Reeve, Conch. Syst. i. pl. 147, figs. 3, 4. — Stimpson, Check Lists, 5.

Shell thin, opaque, white, and in some places pellucid, minutely striated both ways; whorls less than three, the first two minute, and not seen when the shell is viewed in front; the last, widening with great rapidity, becomes large, though it is not tumid, but ap-

pears rather depressed as it lies upon the aperture; the surface is covered with a chalky incrustation, deposited by the animal, apparently instead of an epidermis; it is white, or flesh-colored, and generally with numerous zones of brown, of various widths; when this is removed, the shell is left pellucid; aperture ovate, ample, nearly the whole length of the shell, more than double the size of the body of the shell; outer lip sharp and spreading; inner lip sharp-edged, but margined by a flattened, crescent-shaped, white, channelled space; the sharp edge is lost as it revolves within the shell, and a thin plate of enamel covers the space between it and the junction of the outer lip. Length, nine twentieths of an inch; breadth, thirteen fortieths of an inch.

Fig. 606.

V. zonata.

Specimens have been found on Chelsea Beach, but are most easily obtained from fishes. Davis Straits, 66° 30′; Halifax Harbor, Banks (*Willis*); Eastport, twenty fathoms (*Cooper*); fossil, Montreal (*Dawson*).

It is readily distinguished from the preceding by its more solid structure, its flattened form, its expanded aperture, the flattening of the left lip, and the peculiarity of the surface. Mr. Sowerby sent a specimen from a raised beach on the Frith of Clyde, labelled "*Galericulum undatum*, Brown," which is partly fossilized, but bears a very close resemblance to our shell. The most marked differences in the shell I received are, the greater breadth and excavation of the flattened lip, and a more irregular exterior, which, from the name it bears, I suppose to be constant. It may also be the shell figured in Brown's "Conchology of Great Britain," as *Galericulum ovatum*, but nowhere described. The peculiar coating of the shell adheres very closely, and might not be detected except by accident. Perhaps it does not always exist; but in the striped specimens it will always be found. I should think that specimens entirely white, or flesh-colored, are as often found as the zoned ones. In one fish, caught off Cape Ann, I found about a dozen very large and beautiful specimens.

Genus LAMELLARIA, Montagu. 1815.

Shell ear-shaped, aperture ample, spire small and depressed, pillar spiral.

Lamellaria perspicua.

Fig. 158.

Shell obliquely-ovate, pellucid, white, compressed; aperture very large; spire minute and lateral.

Helix perspicua, Lin. Syst. Nat. 12th ed. p. 1250.
Helix haliotoidea, Lin. Syst. Nat. 1250. — Martini, Conch. i. t. 16, fig. 151.
Bulla haliotoidea, Montagu, Test. Brit. 211, pl. 7, fig. 6, and vign. 2, fig. 6. — Maton and Rackett, Lin. Trans. viii. 123. — Brown, Encyc. Brit. vi. 462. — Wood, Index, pl. 18, fig. 61.
Sigaretus haliotoideus, Lam. An. sans Vert. 1st ed. vi. 208. — Fleming, Edin. Encyc. vii. 66; Brit. Anim. 360. — Brown, Conch. of Great Brit. &c. pl. 44, figs. 1, 2. — Gould, Inv. 1st ed. 244, fig. 158.
Oxynoe glabra, Couthouy, Bost. Journ. Nat. Hist. ii. 90, pl. 3, fig. 16.
Lamellaria perspicua, Stimpson, Shells of New England, 44.
Marsenina Grœnlandica, Stimpson, Check Lists, 5.

Shell small, obliquely-ovate, thin, pellucid, white, smooth and shining; lines of growth very faint; whorls two, the first, situated towards one side, is a mere nucleus for the last, which otherwise constitutes the whole shell; aperture nearly the whole area of the shell; outer lip sharp, entire, and somewhat expanded; inner lip sharp, with the edge a little turned, regularly curved in conformity to the left outline of the shell, and, entering the cavity of the spire, is seen to terminate there; in the other direction, the curvature suddenly ceases, and, forming a slight angle, goes onward to join the outer lip; a thin plate of enamel connects the two lips above. Length, half an inch; breadth, two fifths of an inch.

Fig 607.

L. perspicua.

Several specimens of this shell have been found, all of them in the stomachs of fishes. They are about equal in size, but vary somewhat in shape and convexity. The shell is precisely the same as the European one bearing the above name.

As it is not certain that its entire animal has yet been seen, its genus remains undetermined. Mr. Couthouy rejects the genus *Sigaretus*, because, from what he saw of the animal, he judged the shell to be external, and adopted the genus *Oxynoe* of Rafinesque, with which no one has any acquaintance except its author, and no characters are given of its shell except that it is exterior and bulla-form. It seems better, therefore, to leave it where the conformation of the shell would place it, and where others have arranged it, until its animal is fully known, and its place determined. It will most probably be found to belong to the genus *Coriocella*.

Family NATICIDÆ, Swainson.

Shell spiral, usually smooth or polished, more or less globular; aperture semi-lunar, sometimes very large.

Genus LUNATIA, Gray. 1847.

Operculum simple, cartilaginous.

Shell oval sub-globose; spire rather elevated; aperture semi-lunar; inner lip thin, or with a moderate callus; umbilicus wide; pervious, not funiculate.

Lunatia heros.

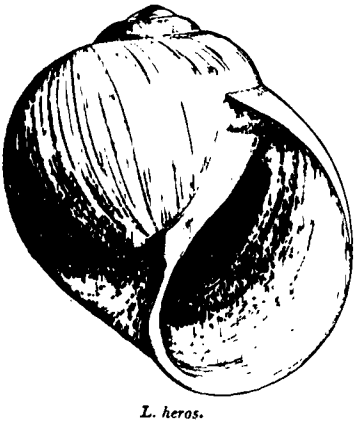
Fig. 160.

Shell sub-globose, ash colored, whorls five, a dark, chestnut colored band revolving about the three upper ones; umbilicus large and simple.

Natica heros, Say, Journ. Acad. Nat. Sc. ii. 248, 1822. — Gould, Inv. 1st ed. 231. — De Kay, N. Y. Moll. 120, pl. 7, fig. 148. — Philippi, Abbild. pl. 1, fig. 4.
Ampullaria borealis, Valenc. in Humb. and Bonpl. ii. Recueil d'Obs. 260.
? *Natica ampullaria*, Lam. An. sans Vert. viii. 633.
Lunatia heros, Stimpson, Check Lists, 5.

Shell globose-ovate, thick, ash colored, or sometimes brownish, shining when divested of its thin, yellowish epidermis; distinct lines of growth, and very minute revolving lines cover the surface; whorls five, very convex, slightly flattened near the top, so as to present a slight angular appearance; the three posterior whorls have the lower half of a dark chestnut color, and the other half rather lighter than the rest of the shell; suture well marked; aperture ovate; the lip, sharp above, becomes thicker and smoothly rounded, and as it rises by the side of the umbilicus it expands to a considerable breadth; a very thin layer of enamel is spread over the portion of the whorl which completes the aperture; throat of a delicate, somewhat clouded chestnut color, with a margin sometimes bright

Fig. 608.



L. heros.

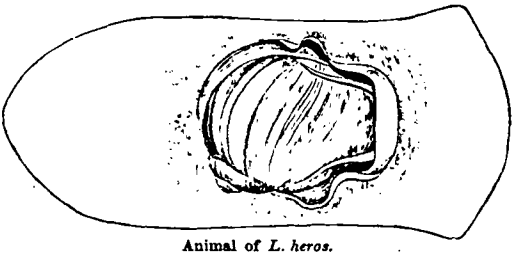
yellow; umbilicus large, rounded, displaying the whorls nearly to the summit, coarsely wrinkled, the callus covering only a very small segment of it. Operculum horny. Ordinary length, two and a half inches; breadth, two inches.

It is found on sandy or muddy beaches along the whole coast; but much more seldom to the south than to the north of Cape Cod. Eastport (*Cooper*); Nova Scotia (*Willis*); Gaspé (*Bell*); Gull Island (*Smith*).

This shell is distinguished from all others by its inflated, globular appearance, and its simple, deep umbilicus. It very much resembles an *Ampullaria*, and is most probably the *Natica ampullaria* of Lamarck. It also grows to a larger size than any other known species. I have one specimen the greatest length of which is four and a half inches, and greatest breadth three and a half inches; and I have seen one five inches by three and three fourths inches. The shell is light for its size, and its whole structure and appearance are very simple.

This, in common with other species of *Naticidæ*, is very voracious, and plays a conspicuous part in devouring the dead fish and other animals which are thrown up by the tide. Many of the shells thrown upon the shore are found to be perforated with a small round hole. This is done principally by the different species of *Lunatia*. They have the power of perforating shells, it is generally supposed, by discharging an acid which decomposes the shell; and through the aperture they extract the juices, and destroy the lives of the otherwise secure inhabitants. Their foot is very large, so as completely to envelop the objects on which they prey. In moving, they burrow in the sand, so as to be almost entirely concealed by it, and their place is generally indicated by a small heap of sand.

Fig. 609.



Animal of *L. heros*.

The singular nidus, in which the animal of *Lunatia* deposits its eggs, has been an object of much curiosity and speculation. It is a mass of sand glued together into the shape of a broad bowl, open at the bottom, and broken at one side. Its thickness is about that of an orange-peel, easily bent without breaking when damp, and when

held up to the light will be found to be filled with little cells arranged in quincunx order. Each of these cells contains a gelatinous egg, having a yellow nucleus, which is the embryo shell. It is found plentifully at midsummer, on every sandy flat where any species of *Naticidæ* resorts. It has passed under many names, and its true nature seems to have been first suspected by Mr. Boys, who gave a description and plate of it in the "Linnæan Transactions," Vol. V. 230, pl. 10. In the fourteenth volume of the same work Mr. Hogg fully demonstrated its character, by hatching, from those found on the English coast, the young of *Natica glaucina*.

To show what a puzzle it has been, I will add some of its names found in books.

Flustra arenosa, Ellis, Zooph. and also his Corallines, pl. 25, fig. *e*.
Flustre areneuse, Lamouroux, Polyp. flex. 111, No. 220.
Flustre arenacee, Blainv. Dict. des Sc. Nat., and Man. d'Actinol. 446.
Eschara lutosa, Pallas, El. Zooph. 37, No. 5.
Eschara millepora arenosa Anglica, Ray, Syn. 31.
Alcyonium arenosum, Gmélin, Syst. Nat. iv. 654. — Shaw, Nat. Miscell. t. 272.
Discopora cribrum, Lam. An. sans Vert. ii. 250.

Lunatia triseriata.

Fig. 165.

Shell ovate-globose, whorls five, usually checkered with three series of dark spots on the lower whorl, and one on the upper whorls; umbilicus small, nearly free.

Natica triseriata, Say, Journ. Acad. Nat. Sc. v. 209. — Gould, Inv. 1st ed. 233. — De Kay, N. Y. Moll. 121, pl. 7, fig. 144. — Philippi, pl. 1, fig. 6.

Shell ovate, approaching to globular, of a yellowish-white or ash color; whorls five, convex, lines of growth distinct, and usually covered with a thin, yellowish epidermis; lower whorl has three revolving series of twelve to fourteen bluish or dark chestnut colored, oblique spots, usually of a square or oblong form, and sometimes crescent-shaped; the upper one just below the suture; the middle one is divided by the junction of the lip, and the third is half-way between it and the umbilicus; the upper one is continued on all the whorls, but the next one disappears soon; the spaces between the spots often appear like whitish bands, and the sutural region is of the same color; spire considerably elevated, sutural line delicate; aperture ovate, lip sharp and white within; a thick white callus covers

Fig. 610.

L. triseriata.

the inner margin, very slightly modifying the umbilicus, where it has a fissure at the posterior margin of the umbilicus; a dense mass of callus, within the aperture, at its upper angle, strengthens the lip; throat colored with dark chestnut, or transmitting the exterior markings; umbilicus rather small and simple, not much wrinkled within; operculum horny. Length, seven tenths of an inch; breadth, half an inch.

Found along the whole coast to the north of Cape Cod, on flats which are left by the tide at low water; but it is as yet doubtful whether it passes to the south of this limit.

This has been thought by some to be the young of the preceding species. In general aspect there is a resemblance; but the proportionate length of this is greater; the thick, white callus indicates a mature shell, and the dark portion of the upper whorls is at the upper instead of at the lower portion of the whorl, as in *N. heros*, and the umbilicus is proportionally smaller instead of larger, as is the case in young shells. Besides, I have never seen a large shell in the localities where this species is abundant. The largest specimen I have seen, which I could distinctly refer to this species, is less than an inch in length. It is evidently analogous to *N. canrena* of Europe.

It varies in marking greatly. Some specimens are of a pale yellow color, and destitute of marking; on some, the spots blend so as to present alternate bands of light and dark color; again, some of the series are blended, and some are not. The spots may be square, oblong, or crescentic, and are usually oblique. The ivory-white callus seems to be the most constant character.

Whole of New England coast, rare south of Cape Cod (*Stimpson*); Banks (*Willis*); Magdalen Bay (*Bell*); Vineyard Sound, six to twelve fathoms.

Lunatia Grœnlandica.

Fig. 166.

Shell small, sub-oval, ash colored; umbilicus imperfect; operculum horny.

Natica pusilla, not of Say. — Gould, Inv. 1st ed. 237, fig. 166.
Natica Grœnlandica, Möller, Fauna Grœnl. 7 — Stimpson, Shells of New England, 43.
Lunatia Grœnlandica, Stimpson, Check Lists, 5,

Shell sub-oval, bluish-white, with a light ash colored epidermis; surface glossy, smooth, or with merely microscopic revolving lines,

and lines of growth; whorls four, regularly convex; spire moderately elevated, blunt; suture fine and deep, the edge of the whorl rising a little by the side of it; sometimes one or two faint, brownish bands may be seen on the lower whorl; aperture ovate, more than half the length of the shell; outer lip thin and sharp; inner margin thick, the callus white, abundant, and pressed into the umbilicus so as to leave only a narrow, curved chink by the side of the lip; throat white; operculum horny. Length, half an inch; breadth, four fifths of an inch.

Fig. 611.

L. Grænlandica.

Taken from fishes caught in Massachusetts Bay, in company with *Natica clausa* and *Mamma immaculata.*

Most of the specimens have about half the dimensions above given.

I was not a little gratified, in looking over a parcel of the *Natica clausa*, to find several specimens differing from them in having a horny instead of a bony operculum, a partial umbilicus, and no flattening of the top of the whorls. In color, size, and general aspect they were the same. On finding that this shell corresponds to Mr. Say's * *Natica pusilla*, I was still more gratified, inasmuch as it is represented in the cabinet of the Academy of Natural Sciences, at Philadelphia, by a species of *Margarita* (*Turbo inflatus*, Totten), and I had despaired of finding any representative elsewhere. Mr. Say remarks, that it is generally mistaken for the young of *N. duplicata.* But the evidences of maturity in its callus, the umbilicus, and the color of the throat, sufficiently distinguish it from both *Neverita duplicata* and *Lunatia heros.*

Grand Manan to Cape Cod (*Stimpson*).

Genus NATICA, Adanson. 1757.

Operculum horny, with a calcareous outer layer.

Shell sub-globose; spire rather elevated; aperture semi-lunar; columella adherent to, and spirally contorted in, the umbilicus; apex more or less dilated and truncate, more rarely convex or rounded.

Natica clausa.

Fig. 167.

Shell sub-globose, more or less tinged with brown; umbilicus closed; operculum calcareous.

* This is not Say's species. See Stimpson, Shells of New England, 1, c. — W. G. B.

Natica clausa, BRODERIP and SOWERBY, Zool. Journ. iv. 360 (1829). — GOULD, Inv. 1st ed. 238, fig. 167. — GRAY, Zool. of Beechey's Voy. 136, pl. 37, fig. 6, and pl. 34, fig. 3. — DE KAY, N. Y. Moll. 122, pl. 7, fig. 150. — STIMPSON, Check Lists, 5.
Natica consolidata, COUTHOUY, Bost. Journ. Nat. Hist. ii. 89, pl. 3, fig. 14. — PHILIPPI, Abbild. pl. 1, fig. 11.
Natica borealis, BECK (not GRAY), teste LOVÈN.

Shell small, sub-globular, surface of a dim lustre, marked by striæ of growth only; color from a livid-white to dark reddish-brown, those of the latter tint exhibiting conspicuously a zone of the former color at the base; epidermis thin, bony, brownish horn color; whorls four or five, tumid, but a portion near the sutures is slightly depressed; spire slightly elevated, obtuse; suture well-defined; aperture oval, unusually wide behind; outer lip sharp, thickened and rounded as it ascends to the umbilicus, which is completely consolidated by an ivory-white, shining callus; on the whorl the callus is thin, but a free deposit of it within the angle firmly supports the junction of the lip to the whorl, a zone of which calcareous deposit also surrounds the umbilical region; throat white; operculum calcareous, bluish-white. Length, twelve twentieths of an inch; breadth, eleven twentieths of an inch.

Fig. 612.

N. clausa.

Taken alive from the stomachs of fishes, plentifully. Cape Cod to Grand Manan (*Stimpson*); fossil at Beauport and Montreal (*Dawson*); Halifax (*Willis*); northwest coast of Greenland (*Hayes*); Canada (*Bell*).

This species is readily distinguished from all others of our coast by its bony operculum, and by its small umbilicus, into which just enough of white callus seems to have been crowded to fill it accurately.

Mr. Sowerby, on actual comparison, declares this to be his *N. clausa;* and, as his description was published several years prior to that given by Mr. Couthouy, his name must take precedence. Mr. Sowerby states it to be nearly an inch in diameter; whereas the dimensions above given exceed those of the specimens usually found with us. But, as it is evidently an Arctic shell, Mr. Sowerby's specimens having been brought from Melville's Island, and I have seen one from the Banks quite as large as those he mentions, I insert also the name given to it by Beck, on the authority of Dr. Lovèn.

Natica pusilla.

Natica pusilla, SAY, Journ. Ac. Nat. Sc. Phila. ii. 257 (1822); 1st ed. BINNEY, 87. — STIMPSON, Shells of New England, 43; Check Lists, 5; not of GOULD, Inv. 1st ed.

Fig. 613.

N. pusilla.

Shell thin, sub-oval, cinereous or rufous, with sometimes one or two obsolete, dilated, revolving bands; columella callous; callus pressed laterally into the umbilicus, whitish; umbilicus nearly closed and consisting only of an arcuated, linear, vertical aperture. Length, about one fourth of an inch.

Inhabits the southern coast. (*Say.*)

Buzzard's Bay, three to eight fathoms (*Stimpson*).

Genus MAMMA, KLEIN. 1753.

OPERCULUM large, horny, simple.

Shell ovate or sub-ovate, solid, smooth, usually without epidermis; spire small, acute, whorls simple; aperture semicircular; inner lip oblique, thickened, callous; umbilicus funiculate; columella adherent to, and spirally contorted in, the umbilicus; the apex more or less dilated, convex, and rounded.

Mamma? immaculata.

FIG. 168.

Shell small, sub-ovate, solid, bluish-white, spotless, glossy, umbilicus free.

Natica immaculata, TOTTEN, Sillim. Journ. xxviii. 351, fig. 6. — GOULD, Inv. 1st ed. 234, fig. 168 — DE KAY, N. Y. Moll. 122, pl. 7, fig. 146.
Mamma? immaculata, STIMPSON, Check Lists, 5.

Shell sub-ovate, extremities rather pointed, solid, milk-white, and glossy when deprived of its thin, greenish-yellow epidermis; spotless, lines of growth faintly perceptible; whorls about five, the spire very short and pointed, and the suture not impressed; the lower whorl convex and rounded, prolonged at the base; aperture narrow oval, rather acutely curved at base; outer lip sharp, inner margin coated with ivory-white callus, not modifying the umbilicus, but extending along the margin to its posterior limit; at the posterior angle of the aperture it is much thickened, and, running along under the junction of the whorls, causes a white spiral line to appear externally, just below

Fig. 614.

M.? immaculata.

the suture; the region before the umbilicus, too, is very white; umbilicus rounded and deep; operculum horny. Length, thirteen fortieths of an inch; breadth, nine fortieths of an inch.

First found by Colonel Totten in Newport Harbor, and afterwards in Provincetown Harbor. It is found plentifully in the stomachs of fishes taken in Massachusetts Bay. Halifax, Banks (*Willis*); Eastport (*Cooper*); whole coast of New England (*Stimpson*).

I know of no species resembling this, except it be *Natica Anglica*, of which some specimens are said to be immaculate. But that shell has a more elongated spire, a broader aperture and base, and its greatest breadth is rather below instead of rather above the middle, as in this species. It is the smallest species with which I am acquainted, though I have seen one specimen two fifths of an inch in length; and, for so small a shell, it is remarkable for its solidity.

Genus NEVERITA, Risso. 1826.

Operculum simple, cartilaginous.

Shell orbicular, depressed; spire flattened; aperture wide, semilunar; inner lip straight, callous; columella adherent to, and spirally contorted in, the umbilicus, the apex more or less dilated and truncate.

Neverita duplicata.

Fig. 164.

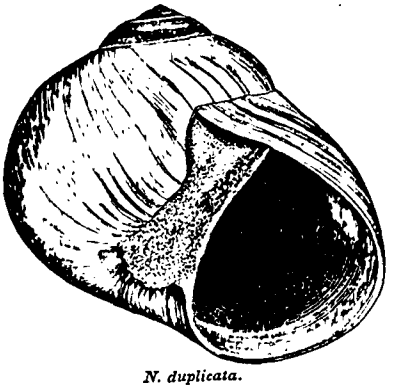
Shell conical-ovate, usually with a dark band above the suture on the upper whorls; umbilicus deeply grooved, and partially or entirely covered with a chestnut colored callus.

Natica duplicata, Say, Journ. Acad. Nat. Sc. ii. 247. — Gould, Inv. 1st. ed. 236. fig. 164. — De Kay, N. Y. Moll. 121, pl. 7, fig. 147. — Philippi, Abbild. pl. 1, fig. 9, not of Reeve (*Lunatia heros*).
Natica Recluziana, Desh. Mag. Zool. 1841, pl. 37. — Reeve, Con. Icon.
Neverita duplicata, Stimpson, Check Lists, 5.

Shell solid, ovate, the upper portion of the whorls compressed so as to give it a pyramidal outline; surface marked with very faint revolving lines, and more conspicuous lines of growth; color light chestnut-brown above a line marking its greatest circumference, whitish or ash colored below it; usually having a dark brown band on the lower portion of the posterior whorls, and the upper portion whitish; whorls five or more, spire rather prominent; aperture ovate, very oblique; outer lip very thin and sharp, joining the whorl

behind by a very small angle, but this angle is so filled up within with callus, that the real aperture is rounded, and at a considerable distance from the junction of the lip; throat chestnut-brown, or livid, lower portion white, generally of a pearly lustre; umbilicus irregular, having a deep groove revolving within it, and covered wholly or partly with a very thick, chestnut-brown callus; operculum horny. Length, two inches; breadth, rather more.

Fig. 615.



N. duplicata.

Inhabits the same localities as *Lunatia heros;* is less common in the vicinity of Boston, but common at Nantucket. Charleston, South Carolina (*Stimpson*); mouth of Rio Grande (*Schott*).

This species is subject to considerable variation in shape, some individuals having the spire much more elevated than others. It is easily distinguished by its conical figure, and by the great amount of callus, which renders it a remarkably heavy shell. Specimens along the Southern coast are generally less elevated, more smooth and brown than those found in Massachusetts. I have a specimen from the Grecian island, Syra, which corresponds with these, except that the colors are brighter, and the shell more smooth, as might be expected if modified by a milder climate. A figure in Lister (pl. 562, fig. 3), represents this shell.

Natica conica, of Lamarck, is a much more elevated shell, though his description might be applied to our shell in every particular.

Its ordinary length is half an inch less than is given above.

[Foot sub-rhomboidal, rounded before as behind, where it is broader than before; broadest about the middle, across the shell; anteriorly light-fawn, posteriorly dark gray, especially at margins; mentum dark gray anteriorly, becoming lighter posteriorly, forming a prominent dark-edged siphon at left side, reflection nearly covering shell; beneath wine-yellow; scissure across foot just in front of broadest part extending forward to a point at middle; tentacles vertically compressed, pyramidal, with maculations on a pale ground, with a narrow black margin each side to point; a flattened lobe at base outside; no eyes. (*Stimpson.*)

Genus BULBUS, Brown. 1839.

Shell ventricose, imperforate; spire with the apex acute; whorls smooth, without epidermis; aperture very wide; inner lip with a large, smooth callus covering part of the body whorl and concealing the umbilicus.

Bulbus flavus.

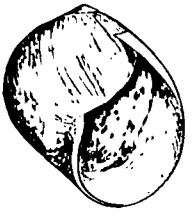
Fig. 162.

Shell thin, sub-globose; aperture large; inner margin sinuous; umbilicus none.

Natica flava, Gould, Sillim. Journ. xxxviii. 196; Inv. 1st ed. 239, fig. 162. — De Kay, N. Y. Moll. 123.
Bulbus flavus, Stimpson, Check Lists, 5.

Shell of an inflated, globular form, light and thin, white, with a bright straw colored or golden epidermis; surface very minutely checkered with very faint, revolving lines, and lines of growth; spire very little elevated, composed of four rounded whorls, a little compressed behind, near the suture, which is faintly impressed; aperture occupying one half the inferior aspect of the shell, broad oval, modified by a curve which looks as though it might be caused by a contraction and obliteration of the umbilicus; outer margin very sharp; umbilical region about the middle of the left margin much retreating, and deeply indented in most specimens, though evidently never open; a thin callus, commencing at the upper angle, expands and thickens over this region, then, narrowing, forms a thick, rounded, ivory, vertical margin to the front of the shell. Length, about one inch; breadth, a little less.

Fig. 616.



B. flavus.

From the collection of Colonel Totten, who obtained it from the Bank fishing grounds. Rimouski (*Bell*); Halifax, Banks (*Willis*); Eastport (*Cooper*).

The aspect of this shell immediately suggests the *Helix aperta*, Born (*H. naticoides*, Drap.), to which it bears a very striking resemblance in shape. If the existence of an umbilicus is an essential characteristic of the genus *Natica*, and so it is laid down by Lamarck, this shell cannot come under it. There is no approach to an umbilicus, even in the youngest specimens, the space intended

to be occupied by one having been apparently thrown into the aperture. There is one other described species conforming to the same type, the *Natica fluctuata*, Sowerby (Tankerville Catal. p. 12), and figured by Dr. Jay in his "Catalogue, 1836," under the provisional name of *N. imperforata*. Their form is so peculiar that Mr. Sowerby has recently grouped them with several others in a new genus, which he calls *Globulus*. Swainson employs the word *Globularia* as having a better termination.

Of the five specimens I have examined, three were mature, and two young. In the oldest, the width of the shell is proportionally greater, and there is a tendency to angularity at about the upper fourth of the last whorl.

Genus AMAUROPSIS, Mörch.

Operculum pauci-spiral, horny, thin.

Shell longitudinally oval, thin, smooth, white, not umbilicated, covered with a light brown epidermis; spire elevated, suture canaliculated; aperture oval, produced in front.

Amauropsis helicoides.

Fig. 161.

Shell ovate, smooth, covered with a dusky yellow colored epidermis; whorls four, spire channelled at the suture; umbilicus a mere line.

Natica canaliculata, Gould, Sillim. Journ. xxxviii. 197 (1840); Inv. 1st ed. 235, fig. 161.
Natica helicoides, Johnston, 1835, Tr. N. H. B. — Reeve, figs. 4, 5, 6.
Amauropsis helicoides, Stimpson, Check Lists, 5.

Shell ovate-globose, rather ponderous, dingy-white, nearly smooth, and somewhat glossy, covered with a dark gamboge colored epidermis; whorls four, the upper portion of each turning before it joins the preceding whorl, so as to form a broad, shallow canal at the suture, and giving the spire a turreted appearance; aperture about two thirds the length of the shell, nearly semi-circular, lip sharp, a little spreading in front, the inner margin nearly a straight line, and overspread with a thick callus; interior white; umbilical opening a mere slit, generally none, one side of which is formed by the callus, sometimes altogether concealed; operculum horny, sub-spiral. Length, one and one tenth inches; breadth, seven tenths of an inch.

Fig. 617.

A. helicoides.

Taken from fishes caught at the Banks, and one fine specimen from a fish caught in Massachusetts Bay. I have a specimen also from the coast of Norway. Halifax (*Willis*); Marcouin (*Bell*); fossil, Montreal (*Dawson*).

The aspect of this shell is such that I was at first led to refer it, doubtfully, to the genus *Paludina*. It very greatly resembles *Paludina ponderosa*, Say. All doubt, however, on that point, has been since happily removed through the kindness of Colonel Totten, who furnished me with several specimens containing the sub-spiral operculum.

The remark of Deshayes, that *Natica* is without an epidermis, will not hold good in regard to this species, nor, indeed, to any of the species found on our coast. He, however, was aware of the small value of this characteristic, and alludes to a species then under his eye, which I take to be *N. heros*, having the shape and epidermis of *Ampullaria*, but the operculum of *Natica*. A specimen sent to me by Dr. Lovèn was regarded by him as new, and he had applied to it the name of *N. exulans*.

Family TURRITIDÆ, H. and A. Adams.

Shell turreted, sub-fusiform; aperture with the fore part channelled, straight, and often much produced; outer lip detached at the hind part from the body whorl, forming a sinus, or with the margin fissured near the last whorl.

Genus PLEUROTOMA, Lamarck. 1799.

Shell turreted, generally ribbed; aperture terminating in a straight, more or less elongated canal; outer lip, at its posterior junction, having a fissure or notch.

Pleurotoma bicarinata.

Fig. 186.

Shell ovate-fusiform, turreted, dusky-white; whorls convex, with two revolving ribs, and other less conspicuous lines and grooves; notch of the lip shallow.

Pleurotoma bicarinata, Couthouy, Bost. Journ. Nat. Hist. ii. 104, pl. 1, fig. 11. — Gould, Inv. 1st ed. 281, fig. 186. — De Kay, N. Y. Moll. 149, pl. 7, fig. 113. — Stimpson, Check Lists, 5.

Mangelia bicarinata, Stimpson, Shells of New England, 49.

Shell small, tapering at both ends, turreted, of a dusky-white or slate color; whorls six, convex, the lowest being half the length of the shell, and marked with numerous, slightly elevated, revolving lines, and smaller intervening ones; about the middle is a deep groove, on each side of which is a prominent revolving ridge or keel, continued upon the upper whorls; lines of growth very minute; aperture elliptical, narrow, ending in a very short canal, inclining a little to the left; outer lip sharp, toothed by the revolving ribs, with a slight recess or notch at its posterior junction; pillar lip arched posteriorly. Length, three tenths of an inch; breadth, three twentieths of an inch; divergence, forty-eight degrees.

Fig. 618.

P. bicarinata.

First found by Mr. Couthouy in a fish caught off Nahant; since this single specimen, three or four others have been found by Dr. Prescott, of Lynn, and Mr. W. W. Wheildon, of Charlestown.

This is not likely to be confounded with any other of our shells. Its two revolving ridges mark it well. It is interesting as being the first species of the genus found in our northern Atlantic waters. Neither of our three species belongs, unequivocally, to this genus; they approach very near to *Fusus*. Still, the direction of the lines of growth indicate the sinus in the lip to be constant; and on this their claim to the genus *Pleurotoma* rests.

Pleurotoma plicata.

FIG. 187.

Shell small, cinereous, ovate; whorls six, reticulated with prominent, longitudinal ribs, and elevated, revolving lines; sinus of the lip distinct.

Pleurotoma plicata, ADAMS, Bost. Journ. Nat. Hist. iii. pl. 3, fig. 6. — GOULD, Inv. 1st ed. 282, fig. 187. — DE KAY, N. Y. Moll. 150, pl. 6, fig. 120. — STIMPSON, Check Lists, 5.

Shell small, elongated-ovate, somewhat turreted, of an ashy-white color; whorls six, the lowest one about two thirds the length of the whole shell, and bearing about twelve prominent, somewhat oblique, rib-like folds, which are crossed by ten or more elevated, revolving threads, rendering the ribs a little nodulous; the other whorls form a very pointed, somewhat turreted spire, on which the ribs and revolving lines are continued. Aperture narrow, less than half the length of the shell; outer lip greatly thickened by one of the ribs, the notch at its posterior part being deep, distinct, and smooth. Length, one fourth

Fig. 619.

P. plicata.

of an inch, nearly; breadth, five fortieths of an inch; divergence, forty-five degrees.

Found in mud from New Bedford Harbor, by Professor C. B. Adams. Banks (*Willis*).

This species is of about the same size and shape as *Bela decussata*, but is distinguished by the much more conspicuous folds, which run the entire length of the whorl; and the revolving lines also are much more distinct, and fewer in number. The canal is very short.

Genus BELA, Leach. 1847.

Shell ovate, fusiform; surface dull, smooth, or longitudinally ribbed; spire elevated, shorter than the body whorl; columella flattened; canal short; outer lip with a small sinus at its junction with the body whorl.

Bela turricula.

Fig. 193.

Shell white, thin, whorls very conspicuously angulated and turreted, with twelve or fourteen prominent ribs, and numerous distinct, revolving lines.

Murex turricula, Montagu, Test. Brit. 262, pl. 9, fig. 1. — Turton, Conch. Dict. 93. — Dillwyn, Catal. 744. — Maton and Rackett, Lin. Trans. viii. 144; Dorset Catal. pl. 14, fig. 15. — Wood, Index, pl. 27, fig. 133.
Fusus turriculus, Brown, Conch. of Great Brit. pl. 48, figs. 51, 52.
Fusus turricula, Fleming, Brit. Anim. 349. — Gould, Inv. 1st ed. 292, fig. 193.
Murex angulatus, Donovan, Brit. Shells, v. 156.
Bela turricula, Stimpson, Check Lists, 5.

Shell thin, pure white, sometimes yellowish or brownish-white; with seven or eight whorls, rising nearly perpendicularly from each other to an acute apex, and having an abrupt, broad, nearly flat slope at their summits; surface with twelve or fourteen somewhat oblique, rather compressed ribs, which vanish before attaining the front, traversed by numerous distinct, elevated lines, of which one at the angle of the whorls is most prominent, these obsolete at the edge of the ribs; beak short, open, and nearly sharp, or thickened by a rib; inner lip smooth, slightly arched. Length, two thirds of an inch; breadth, one fourth of an inch; divergence, forty-two degrees.

Fig. 620.

B. turricula.

Found in considerable numbers, and in a very fresh state, in the

stomachs of fish. It is one of the shells common to both Atlantic shores. Halifax (*Willis*); Eastport (*Cooper*).

This is a very pretty shell, and is not likely to be confounded with any other except *B. harpularia.* From this it is distinguished by being a more delicate shell, by its color, by the smaller number of ribs, and by the remarkably turreted appearance of the whorls. The raised line, revolving at their angle, is so great as to produce a small tubercle there, on each of the ribs. The aperture is usually about half the length of the shell; but there is a variety in which the aperture is about one third the length of the shell, and the ribs are more numerous. Mr. Sowerby intimates that our shell may not be identical with the European type; but, on the whole, I cannot persuade myself to regard them as different. The variety is like the *Murex angulatus*, figured by Donovan.

Bela harpularia.

FIG. 191.

Shell long-ovate, pointed, turreted, flesh-colored; whorls angular above, with about sixteen oblique, rounded folds and numerous revolving lines.

Fusus harpularius, COUTHOUY, Bost. Journ. Nat. Hist. ii. 106, pl. 1, fig. 10. — GOULD, Inv. 1st ed. 291, fig. 191. — DE KAY, N. Y. Moll. 146, pl. 9, fig. 187.
Tritonium harpularium, LOVÉN, Moll. Sc. 12.
Bela harpularia, STIMPSON, Check Lists, 5.

Shell ovate-oblong, turreted, of a brownish flesh-color, composed of six or eight angulated whorls, flattened above the angle, so as to form a slightly sloping shoulder; lower whorl more than half the length of the shell, having about eighteen oblique, rounded plaits or ribs, vanishing before they reach the beak, and crossed by fine revolving lines, most conspicuous in the interstices; the upper whorls are marked in the same manner; beak white, short, somewhat curved, and pointed; aperture narrow, broadest and angular behind; the outer lip sharp; inner lip white, smooth, and moderately arched, twisting outwards at the commencement of the beak. Length, half an inch; breadth, one fourth of an inch; divergence, forty-eight degrees.

Fig. 621.

B. harpularia.

First found by Mr. Couthouy, in fish taken near Nahant, and frequently obtained since from the same locality. Banks (*Willis*); Eastport (*Cooper*); fossil, Montreal (*Dawson*).

It bears a close resemblance to *B. turricula;* and Mr. Sowerby

seems rather disposed to regard it as such. But the marks of distinction are constant. The flesh color is invariable; the length of the body whorl proportionally greater, and it is more convex, and less angular; the folds are more oblique, more rounded, and the beak is shorter, but more curved.

From *B. pleurotomaria* it is distinguished by a less dark color, less prominent but closer ribs, more conspicuous shoulder, and by its less elongated and slender form, and the absence of a notch at the posterior junction of the outer lip.

It has a general resemblance to pl. 48, figs. 43, 44, of "Brown's Conch. of Great Brit. &c.," which he calls *Fusus castaneus*.

Bela violacea.

Shell purplish-black, longitudinally sub-plicate, transversely striate; whorls six, the last carinated above and with evanescent median folds, the other whorls medially carinated; spire acute; aperture narrow; canal short.

Pleurotoma violacea, MIGHELS and ADAMS, Bost. Journ. Nat. Hist. iv. 51, pl. 4, fig. 21 (1842).
Bela violacea, STIMPSON, Check Lists, 5.

Shell small, of a blackish-purple color, ovate, with a pale brown epidermis, irregularly sub-plicate, with numerous faint, revolving striæ decussated by the incremental striæ; whorls six; whorls of the spire carinate in the middle; last whorl shouldered by a continuation of the same carina, with the plications terminating on its convexity; spire acute, conic; suture distinct; aperture narrow, rather less than half the length of the shell; labrum simple, sharp, regularly curved, with the sinus at the extremity; canal short, wide. Length, three tenths of an inch; breadth, fifteen hundredths of an inch; divergence, forty degrees.

Fig. 622.

B. violacea.

Casco Bay; found without the animal, at low-water mark, in the summer of 1840, and subsequently in the stomachs of haddock.

This species is remotely allied to *B. decussata*, Couthouy; our shell, however, is always longer, aperture narrower, and the sculpture less regular and distinct; but it is especially characterized by having the spiral carina far below the suture. (*Mighels* and *Adams*.)

Banks (*Willis*); Massachusetts Bay (*Stimpson*).

[Animal, siphon yellowish, one twentieth of an inch; tentacula short and thick; eyes black, on exterior side, about two thirds the length of tentacula; a sinus in the middle of posterior part of disk.

Bela decussata.

FIG. 185.

Shell oval, ash or flesh-colored, with twenty-five minute folds, and close revolving lines; notch of the outer lip shallow.

Pleurotoma decussata, COUTHOUY, Bost. Journ. Nat. Hist. ii. 183, pl. 4, fig. 8. — GOULD, Inv. 1st ed. 280, fig. 185. — DE KAY, N. Y. Moll. 150, pl. 36, fig. 344.
Bela decussata, STIMPSON, Check Lists, 5.

Shell small, ovate, of an ash-white, or flesh-color, covered with remnants of an olive colored epidermis; whorls five or six, convex, the lowest being two thirds the length of the shell, covered with twenty-five to thirty inconspicuous folds or ribs, undulated and oblique in conformity to the outer lip, and vanishing on the convexity of the whorl; lines of growth regular and distinct, and these, with numerous, elevated, revolving threads, make a fine network over the whole shell; spire regularly sloping to an acute point; suture well-marked, with a slight shoulder near it on the whorls; aperture half as long as the shell, narrow, oval, terminating in a broad and very brief channel; outer lip sharp, with a shallow recess or notch, as it joins the whorl; pillar arched, flattened, and smooth; operculum pear-shaped, with the apex below, and the elements concentric. Length, seven twentieths of an inch; breadth, three twentieths of an inch; divergence, forty-eight degrees.

Fig. 623.

B. decussata.

Found in the stomachs of fishes, not unfrequently. Marblehead (*Haskell*); Eastport (*Cooper*); Banks (*Willis*).

This is not liable to be confounded with any shell of our coast, except *B. harpularia*, to which it has a miniature resemblance. But, besides being so much smaller, it is distinguished by the notch at the posterior angle of the aperture, and by the network formed by the more numerous and fainter folds, and revolving lines. The color, which Mr. Couthouy makes a distinctive mark, is very nearly the same. His specimens were less perfect and white. In my freshest specimen there is a broad, lighter-colored band near the top of the lower whorl. *Pleurotoma reticulata*, Brown ("Conchology of Great Britain," &c., pl. 48, figs. 29, 30), may, perhaps, be intended to represent the same.

Bela, cancellata.

Shell subulate, longitudinally plicate, transversely striate; whorls seven, convex; suture strongly impressed; spire acuminate; apex acute; aperture sub-ovate; lip crenated.

Fusus cancellatus, MIGHELS and ADAMS, Bost. Journ. Nat. Hist. iv. 52, pl. 4, fig. 18 (1842).
Bela cancellata, STIMPSON, Check Lists, 5.

Shell rather slender, turreted, with about twenty longitudinal ribs, running a little obliquely to the left, crossed by numerous transverse, revolving, raised lines, giving the shell a cancellated appearance; whorls seven, convex; suture well impressed; spire gracefully tapering; apex acute; columella slightly arched at the upper part; aperture rather narrow, sub-ovate; canal short, straight, rather wider at the base; labrum thin, delicately crenated by the transverse striæ. Length, thirteen twentieths of an inch; breadth, one fourth of an inch; divergence, twenty-two degrees.

Fig. 624.

B. cancellata.

Casco Bay; taken from the stomachs of haddock in the summer of 1840. It must be regarded as very rare.

This species is very nearly allied to *Murex purpureus*, Montagu ("Turton Conch. Dict." 95), but is distinct in having a less number of volutions by three or four, by the direction of the ribs, which are "obliquely to the right" in *M. purpureus;* Montagu's shell is also described as "rugged," "very rough," &c., terms which will not apply to our shell; it is also said to be "purple," which color is regarded by the author as characteristic; our shell is variously colored, some specimens being tinged with purple, others are white. (*Mighels* and *Adams.*)

Bela pleurotomaria.

FIG. 192.

Shell slender and tapering, fawn-colored; whorls eight, having eighteen or twenty oblique, rounded folds, and minute revolving lines.

Fusus rufus, GOULD, Inv. 1st ed. 290, fig. 192, not of English authors. — DE KAY, N. Y. Moll. 146, pl. 9, fig. 189.
Bela pleurotomaria, STIMPSON, Check Lists, 5.
Fusus pleurotomarius, COUTHOUY, Bost. Journ. Nat. Hist. ii. 107, pl. 1, fig. 9.

Shell elongated, tapering to an acute point, reddish-fawn colored; whorls eight, slightly convex, with numerous obliquely undulating folds or ribs, amounting sometimes to eighteen or twenty; these are

quite regular and prominent, the interstices or excavations between them being of equal width with the folds; they are most prominent on the upper whorls, and vanish about the middle of the lower whorl; there are numerous inconspicuous revolving lines, most distinct at the base; larger whorl rather more than half the length of the shell, with a slight shoulder at the suture; aperture short and narrow, having a slight notch at its posterior angle, and terminating abruptly in front, without an elongated canal; outer lip sharp; pillar smooth, moderately arched. Length, three fourths of an inch; breadth, one fifth of an inch; divergence, forty degrees.

Fig. 625.

B. pleurotomaria.

Found not unfrequently in the stomachs of fishes, though rarely in a fresh state. Banks (*Willis*); Eastport (*Cooper*); Cape Cod, northward (*Stimpson*).

On comparison with specimens sent from England, I coincide with Mr. Sowerby in opinion, that this shell, first found in our waters by Mr. Couthouy, and described by him as new, is the *Murex rufus* of Montagu. It is, however, generally much larger than those known to Montagu, his specimens being less than half an inch in length.

It is a well-marked species, though varying much in its depth of color, and in the distinctions of the spiral lines. The spaces between the ribs are deep, as if grooved out. The canal is almost too short for the genus *Fusus*, while the notch of the lip approximates it to *Pleurotoma*.

[Now considered distinct from *Fusus rufus*.

Family COLUMBELLIDÆ.

No canal at the base of the aperture, but a more or less distinct notch; pillar plaited.

Genus COLUMBELLA, Lamarck. 1799.

Shell oval, spire short, pillar plaited; outer lip thickened internally, narrowing the aperture.

Columbella avara.

Fig. 197.

Shell small, elongated-ovate, pointed, of various shades of brown reticulated with white, with numerous smooth ribs lengthwise, and revolving lines between them.

Columbella avara, SAY, Journ. Acad. Nat. Sc. ii. 230 (1822). — GOULD, Inv. 1st ed. 313, fig. 197. — ADAMS, Bost. Journ. Nat. Hist. ii. 363. — DE KAY, N. Y. Moll. 139, pl. 8, fig. 179. — SOWERBY, Thes. 128, pl. 38, fig. 110. — STIMPSON, Check Lists, 5.

Shell small, ovate-conic, elevated, strong, of a light straw color, finely reticulated or blotched with various shades of reddish-brown; surface covered with equal and regular revolving lines, interrupted by as many as fifteen smooth, obtuse folds or ribs running lengthwise of the shell; and as the folds extend only half the length of the lowest whorl, the remaining half is marked by the revolving lines only; whorls six, nearly flat, forming an elevated, pointed spire; suture distinct, and somewhat scalloped by the folds; aperture narrow-oval, about one third the length of the shell; very little contracted by the thickening of the middle of the outer lip; this lip is simple, somewhat thickened externally, and having a series of lengthened teeth just within the margin; inner lip invested with a plate of callus, which is also toothed in a similar manner, in mature shells; operculum horny. Length, three fifths of an inch; breadth, one fourth of an inch; divergence, thirty-three degrees.

Fig. 626.

C. avara.

Sent me from Martha's Vineyard by Dr. L. M. Yale. Professor Adams says it is common at New Bedford and vicinity, also at Falmouth and Nantucket. Cape Cod, however, seems to be its northern limit, though a solitary, worn specimen is occasionally found within the Capes. It lives below low-water mark. It is abundant on the shores of the Southern States. Gull Island (*Smith*).

Mr. Say referred this shell, somewhat doubtfully, to the genus *Columbella;* and as it still remains equivocal between *Columbella* and *Buccinum*, it is best to let it remain where he placed it. It varies much in its length and coloring, being in general longer than described by Say. It is usually covered with a dirty-brownish pigment. The middle of the last whorl is frequently angular, especially in immature shells; in these too, and indeed in a majority of the shells I have seen, the denticulations of the aperture are wanting. There is, however, no other shell resembling it on our coast, and it is easily recognized.

Columbella rosacea.

FIG. 195.

Shell small, acutely conic, white, tinged with rose color; whorls six, covered with spiral lines; aperture ovate, shorter than the spire, pillar arched and flattened, lip sharp, and without teeth within.

Buccinum rosaceum, GOULD, Sillim. Journ. xxxviii. 197; Inv. 1st ed. 311, fig 195.
Columbella rosacea, STIMPSON, Check Lists, 5.

Shell small, elongated, acutely conic, white, tinged with rose color, closely covered with minute revolving lines, most conspicuous near the base of the shell, in most parts microscopic; lower whorl as long or longer than the rest of the spire; suture faintly impressed, but distinct; aperture about two fifths the length of the shell, narrow-ovate; outer lip sharp, a little everted, smooth within, gently curving to its junction with the spire; pillar arcuated, a little flattened, smooth, and white. Length, three tenths of an inch; breadth, three twentieths of an inch; divergence, forty degrees.

Fig. 627.

C. rosacea.

This little shell I took from fish caught off Cohasset. It has since been frequently found in fishes taken in various parts of Massachusetts Bay. Eastport, white variety (*Cooper*); Banks, Sable Island (*Willis*).

It belongs to Kiener's section of *Columbella*-formed *Buccinum*, and greatly resembles his *B. lacteum* in size and general appearance, but is different in color, wants the peculiar spots, and is not toothed within the lip. It is not plaited like *B. pulchellum* and *B. dermestoideum*. Some specimens are beautifully tinted with rose-red, but others are of a dingy-white, or tinged only around the apex. In one specimen there is something like a dark band just above the suture, and emerging from the posterior angle of the aperture. The revolving lines are very minute, and in old specimens are scarcely discerned on the spire. To the naked eye the shell appears smooth and shining.

It is probable that both this species and *Buccinum lunatum* actually belong to the genus *Columbella*. [There is now no doubt of it.

Columbella dissimilis.

Shell small, ovate-conical, solid, longitudinally substriate, fuscous, often with three white zones; whorls five, flattened; aperture sub-equalling the half of the spire.

Columbella dissimilis, STIMPSON, Proc. Bost. Soc N. H. iv. 114 (1851); Shells of New England, 47; Check Lists, 5.
Buccinum zonale, LINSLEY, Shells of Connecticut, Sillim. Journ. o. s. xlviii. 285.

This species differs from the *C. lunata* in its want of revolving lines on the rostrum, and in its color. *Buccinum zonale*, Linsley,

Connecticut, is probably the young of this species, but the name is preoccupied. The animal resembles that of *C. lunata*, except in its color, which is white. Length, twenty-three thousandths of an inch; breadth, one hundredth of an inch. Laminarian and Coralline Zones. Eastport Harbor and Grand Manan (*Stimpson*).

Fig. 628.

C. dissimilis.

Columbella lunata.

FIG. 196.

Shell small, ovate-conic, surface smooth; color reddish-brown, with two series of crescent-shaped, whitish spots; aperture oval, its outer lip dark brown, and toothed within.

Nassa lunata, SAY, Journ. Acad. Nat. Sc. v. 213. — DE KAY, N. Y. Moll. 131, pl. 7, fig. 162*.
Buccinum lunatum, ADAMS, Bost. Journ. Nat. Hist. ii. 266. — GOULD, Inv. 1st ed. 312, fig. 196.
Columbella lunata, SOWERBY, Thes. 141, pl. 140, fig. 164. — STIMPSON, Check Lists, 5.

Shell small, ovate-conic; whorls six, slightly convex, separated by a shallow suture; surface altogether smooth, excepting a single revolving line below the suture, and a few around the base; color reddish-brown or fawn color, with two, and sometimes three, series of crescent-shaped, yellowish spots on the lower whorl; the light color often predominating over the dark; aperture oval, narrow, with a small sinus or recess at the posterior angle, and ending in a very short canal in front; outer lip simple, and dark brown, toothed along its inner margin; pillar covered with brown callus, the outer edge of which is somewhat elevated. Length, one fifth of an inch; breadth, one tenth of an inch; divergence, forty-three degrees.

Fig. 629.

C. lunata.

Found abundantly to the south of Cape Cod, as far north as Provincetown, about Martha's Vineyard, Nantucket, and Buzzard's Bay. Swampscott and Nahant Beaches, alive (*Haskell*). Professor Adams remarks that they are found associated, almost without exception, with *Bittium nigrum*, but much less abundant. In spring they are found upon the surface of the sand. Their station, however, is a few feet below low-water mark, clinging to stones, seaweed, and other shells.

The principal variations arise from the greater or less elongation of the spire, and from the different proportions of the brown and white coloring; sometimes the shell is almost entirely brown, and at others there is scarcely enough brown to define the crescentic spots.

Mr. Say describes the animal as follows: "pale-whitish, foot linear, nearly as long as the shell, acute behind, hardly larger than the respiratory trunk, truncate before; trunk more than half as long as the shell, obtuse at tip, with a brown annulation near the tip, and another near the base; tentacula short, cylindrical, annulate with blackish on the middle; eyes black, placed on the base of the tentacula."

This species also has proved to be a *Columbella*.

Family PURPURIDÆ, Brod.

Shell with a short, ascending canal, or an oblique notch, or semi-canal, directed upwards.

Genus PURPURA, Brug. 1789.

Shell oblong-oval; last whorl large; spire short; aperture ovate, large, with an oblique channel or groove at the fore part; columella flattened; outer lip simple.

Purpura lapillus.

Shell ovate, pointed, solid, variegated in color, white, yellow, chocolate, and often banded with white; surface with numerous coarse, revolving ridges; aperture oval, outer lip thickened, and toothed within.

Buccinum lapillus, Lin. Syst. Nat. 1202. — Pennant, Brit. Zool. iv. 218, t. 72, fig. 89. — Martini, Conch. iii. 429, t. 121, figs. 1111, 1112, and iv. 22, t. 122, figs. 1124, 1125, &c. — Donovan, Brit. Shells, pl. 11. — Wood, Index, pl. 23, fig. 62. — Montagu, Test. Brit. 239.

Tritonium lapillus, Müller, Zool. Dan. Prodr. 244.

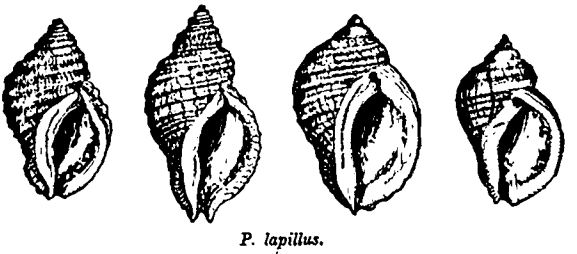
Purpuro-Buccinum, Da Costa, Brit. Conch. 125.

Purpura lapillus, Lam. An. sans Vert. (1st ed) vi.; 2d ed. x. 79. — Gould, Inv. 1st ed. 301. — Kiener, Iconog. (*Pourpre*) 101, pl. 29, 30, 31, figs. 77–77 *s*. — Fleming, Brit. Anim. 341. — De Kay, N. Y. Moll. 135, pl. 8, fig. 175. — Stimpson, Check Lists, 5.

Shell ovate, acutely pointed at both extremities, thick and solid, varying in color, from white through yellow to a dark chocolate, and often with bands of white or yellow, of different widths; surface more or less wrinkled and encircled with numerous coarse, unequal ridges. Some are nearly smooth, and others, at the lines of growth, have series of raised, concave scales, which render the whole shell rough and prickly to the touch; whorls five or six, in some convex, so that the spire appears turreted, in others flattened

below the sutures, so as to be pyramidal; aperture oval, the outer lip regularly curved, sharp, but thickened, and armed with blunt teeth at a little distance within, so that the aperture appears spread-

Fig. 630.



P. lapillus.

ing; the pillar lip moderately flattened, smooth, its lower portion a little twisted, so as to form a moderate projection within the shell, and a crescent-shaped umbilical depression outside; canal short, turning a little to the right; throat generally light reddish-brown, with a lighter border to the lip. Operculum horny, elliptical. Common length, one and one fourth inches; breadth, seven tenths of an inch.

Inhabits the ocean rocks everywhere, from Greenland through all New England.

While there is an individuality about this shell, by which it is easily recognized, yet it is infinitely varied in its details. All specimens have the coarse, revolving ridges, and the peculiar twist of the flattened pillar, characteristic of the genus. They may be divided into two groups, those with a smooth, and those with a rasp-like surface. The smooth shells are the most solid, and are usually flattened near the suture, so as to give the shell a rhomboidal, rather than an ovate outline. This smoothness is not the effect of age, as has been generally stated, for the young shells, in both groups, are like the old. In these there is nothing like an umbilicus. These are the true *P. lapillus*.

In the other group, the whorls are more convex, the suture deep, and the surface is rendered rasp-like by the sharp, scalloped edges of the successive lines of growth, which are most conspicuous in the youngest specimens. In these the callus is abundant upon the pillar, and rises in such a manner as to seem to cover an umbilicus. In some specimens it is so abundant at the posterior angle of the aperture, that the two lips are continuous, and their junction rounded. The canal in this variety is more decided and longer. This

variety is Lamarck's species *P. imbricata.* (See De Kay, l. c. pl. viii. fig. 172.)

As to coloration, both varieties pass from white through yellow to a dark chocolate or slate-color; but specimens of the first group are both lighter and darker than those of the second group. It is in the first group only that I have met with the banded varieties. These have the portion next the suture, the base, and a central zone dark, and the remainder white; and they constitute Lamarck's species *bizonalis* (v. De Kay, 136, pl. viii. fig. 174). Kiener has figured many varieties, but it would be impossible to represent every aspect of a shell, in which no two individuals may be found exactly alike.

Kiener states that the animal, which is perfectly white, is very carnivorous, and that by it are produced, principally, the perforations so frequently observed in bivalve shells on the shore. This remark might apply to many of the perforated univalve shells; but it would hardly be expected that this animal, whose residence is confined to the rocks, should feed upon the animals of bivalve shells, which reside only in sand or mud. The *Naticidæ* are the more probable depredators in this case.

Genus NASSA, Lamarck. 1799.

Shell ovate, ventricose, body whorl variously sculptured; aperture ovate, with a short, reflected, truncated anterior canal; inner lip smooth, often widely spread over with enamel, with a posterior callosity or blunt dentiform plait; outer lip dentated, internally crenulated.

Nassa obsoleta.

Fig. 210.

Shell ovate, dark reddish-brown, covered with a network of lines, and oftentimes folded; aperture ovate, dark violet, right lip simple and sharp, with elevated lines within.

Nassa obsoleta, Say, Journ Acad. Nat. Sc. ii. 232. — Stimpson, Check Lists, 5.
Buccinum Nov-Eboracensis, Wood, Index, Suppl. pl. 4, fig. 26.
Buccinum oliriforme, Kiener, Iconog. (*Buccin*), pl. 25, fig. 99. — Lam. An. sans Vert. x. 201.
Buccinum obsoletum, Adams, Bost. Journ. Nat. Hist. ii. 267. — Gould, Inv. 1st ed. 308, fig. 210.

Shell ovular, inelegant, dark reddish-brown or olive colored, somewhat shining; whorls six, convex, composing a moderately

elevated spire, rather blunt at the apex, which, however, is generally much eroded; suture distinctly marked; surface marked with numerous unequal, revolving lines, which are crossed by minute lines of growth, and larger or smaller, more or less numerous oblique folds; these always exist on the smaller whorls, but are often entirely wanting on the lower whorl, the whole giving the shell a granular appearance; aperture oval, outer lip simple and sharp, not thickened within, but marked with elevated lines not reaching the margin, in adult specimens; pillar deeply arched, overspread with enamel, having a protuberance or fold at its front, turning into the interior; canal a mere notch; throat purplish-black, fading within, and, in almost every instance, with a bluish-white band at its posterior third; something similar is found on the opposite lip; operculum horny, not serrated. Length, one inch; breadth, one half inch; divergence, fifty degrees.

Fig. 631.

N. obsoleta.

The animal is variously mottled with slate color; the foot is as long as the shell, its anterior angles prolonged and turned backwards; head not extending beyond the shell; eyes black, on the exterior side of the tentacula, and above the base; above the eyes the tentacula are suddenly diminished, and bristle-shaped; trunk cylindrical, channelled beneath, half as long as the shell, and very conspicuous.

Its movements are very active, and it collects in numbers about dead crabs and other marine animals, on which it feeds.

Inhabits all our muddy shores, preferring situations not exposed to the surf of the open sea; such as inlets and extended flats which are drained at low tide. It is found abundantly at the confluence of fresh and salt water, where the taste is merely brackish. Professor Adams remarks, that the finest specimens he had found "were growing at Nantucket, where they are as abundant as in any of our continental harbors."

No shell of equal size is so abundant on the whole Atlantic shore. Specimens from Florida vary only in being smaller, more olivaceous, and by having a thick, broad callus over the pillar.

The younger shells are most likely to be collected, because the old ones become very much eroded and defaced, and a greenish, mould-like plant vegetates abundantly upon them. Very few, therefore, of the shells usually collected have the lines on the interior of the outer lip. Kiener's figure represents an immature shell.

Nassa trivittata.

FIG. 211.

Shell ovate-conic, turreted, greenish-white, surface wrought into a network by elevated, decussating lines; sometimes with three dark bands on the lower whorl; raised lines within the lip.

Nassa trivittata, Say, Journ. Acad. Nat. Sc. ii. 231. — STIMPSON, Check Lists, 5.
Buccinum trivittatum, ADAMS, Bost. Journ. Nat. Hist. ii. 265. — GOULD, Inv. 1st ed. 309, fig. 211.

Shell ovate-conic, turreted, apex acute, greenish or yellowish-white, cross-barred, so as to appear granulated, by means of prominent, equidistant, longitudinal lines, and ten, equally regular, revolving impressed lines on the larger whorl, and a somewhat more conspicuous groove near the summit of each volution; whorls seven, flattened above, so as to present a conspicuous shoulder at the suture; in the best specimens there is a dark band at the top, on the middle, and at the front of the body whorl, each occupying two series of granules; the lower line of granules on each whorl is also colored, aperture oval, terminating behind in a canal formed by a dilatation of the right lip, and a fold on the left, and before in a short, ascending beak which is divided from the body of the shell by a deep groove; outer lip sharp, and scalloped by the revolving lines; pillar regularly arched, with a distinct revolving ridge bordering the canal, and covered, to a considerable extent, with greenish enamel; throat white, or with brown bands corresponding to those on the outside; a few elevated lines within, not reaching the margin; operculum horny, of an irregular, three-sided shape, one half its edge sharply serrated. Length, seven tenths of an inch; breadth, three tenths of an inch; divergence, forty-five degrees.

Fig. 632.

N. trivittata.

Found in a worn state on most of our sea-beaches, and occasionally alive at Chelsea. Dr. William Prescott of Lynn found it alive, in abundance, at low-water mark, on Phillips's Beach; Professor C. B. Adams found it at New Bedford, and says it is abundant at Nantucket, on the inner side of Brant Point, and also on the south shore, less abundant but larger. Halifax (*Willis*); Eastport (*Cooper*); Gaspé (*Bell*); Gull Island (*Smith*); Vineyard Sound (*Desor*); Georgia (*Couper*).

No other shell inhabiting our coast bears any near resemblance to this. Its sculpture is like that of *B. marginulatum* from the Indian Seas, and its whole appearance is very much like that of Kien-

er's *B. Roissyi* from the Australian Seas. It undergoes considerable variation. The three lines of rufous color which suggested its specific name are very rarely seen on shells in this latitude; and then, again, we find all the revolving lines more or less colored. In some, the two sets of lines are precisely alike in size and distance; in others, the longitudinal lines are much the most distant, and become more like undulating folds. These last may be regarded as a well-marked variety; they are also more acutely pointed, and the shoulder at the suture is more rounded. Specimens from Nantucket have the inner margin thickly coated to a considerable extent with enamel, while those found near Boston have none. I have a specimen nine tenths of an inch long.

[Animal whitish, sparsely dotted with pale lilac; foot slightly bifid behind with two erect subulate processes. Very active. Comes out of the sand towards low-water mark in a minute or two after the water passes over them.

Nassa vibex.

FIG. 212.

Shell thick, short, ovate-conic; surface checked with waving folds and revolving lines; and alternately zoned with light and dark color; lip thickened and toothed within; pillar with a broad and thick callus, granulated at base.

Nassa vibex, SAY, Journ. Acad. Nat. Sc. ii. 231 (1822); Amer. Conch. pl. 57, fig. 2 (1834). — STIMPSON, Check Lists, 5.
Buccinum vibex, ADAMS, Bost. Journ. Nat. Hist. ii. 264.

Shell solid, short, ovate-conic, of an ashy-white color; whorls six, suture very fine; body whorl with about twelve undulating folds or ribs, crossed by about ten elevated lines, most distinct on the ribs; the space between the two upper lines is more deeply indented, forming pits between the ribs; a pale-reddish zone encircles the top, the middle, and generally the base of this whorl, the upper one and the ribs being continued to the apex; aperture oval, outer lip thickened without and within, with four or five teeth within; pillar very concave, callus abundant, with a few granules at its termination; canal very short, separated from the body by a furrow. Length, half an inch; breadth, three tenths of an inch; divergence, sixty-seven degrees.

Fig. 633.

N. vibex.

Specimens of this shell are rare, and usually have a chalky aspect. They have been found only to the south of Cape Cod. Mr.

Say had it from South Carolina; and I have specimens of a shell from the Spanish Main which differ only in the greater development of callus and brighter colors.

[Animal: foot large, auriculate at anterior angles, narrowed behind, with short terminal cirri, broadest before middle; about one and a half times the length of the shell; above matted with flake-white punctate blotches on a dark gray ground; a broad whitish middle line on top; head broad; eyes at posterior fourth; points of vibracula very slender; head with dark gray maculations. Siphon nearly as long as shell, constantly vibrating. Below white, grayish along middle, with longitudinal clouds. (*Stimpson.*)

Genus BUCCINUM, Lin. 1767.

Shell ovate-conic; aperture having a notch without a canal, in front; pillar not flattened, somewhat twisted.

Buccinum undatum.

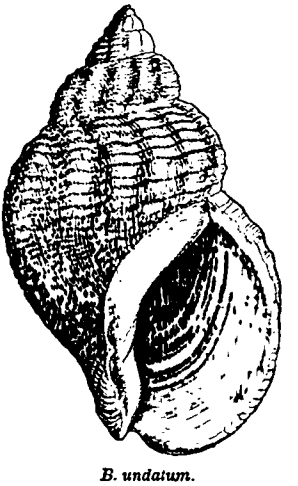
Shell ovate-conical, ventricose, with broad folds and coarse, revolving lines; whorls six, convex; epidermis grayish; aperture yellowish, lip slightly notched; pillar twisted, canal a mere notch.

Buccinum crassum rufescens, Lister, Conch t. 962, fig. 14*.
Buccinum undatum, Lin. Fauna Suec. No. 2163; Syst. Nat. No. 475. — Gmélin, 3492. — Knorr, Vergn. iv. t. 19, fig. 1. — Martini, Conch. iv. t. 126, figs. 1206 - 1209. — Pennant, Brit. Zool. t. 73, fig. 9. — Hutch. Dorset Catal. 42, t. 17, fig. 6. — Montagu, Test. Brit. 237. — Kiener, Iconog. pl. 2, fig. 5. — Drummond, Letters to a Young Naturalist. — Blainv. Malacol. pl. 22, fig. 4. — Sowerby, Conch. Man. fig. 421. — Donovan, Brit. Shells, iii. 104. — Wood, Index, pl. 23, fig. 107. — Brug. Encyc. Méth. pl. 399, fig. 1. — Gould, Inv. 1st ed. 305. — De Kay, N. Y. Moll. 130, pl. 7, fig. 161. — Lam. An. sans Vert. x. 154. — Stimpson, Check Lists, 5.
Buccinum vulgare, Da Costa, Brit. Conch. 122, t. 6, fig. 6.
Tritonium undatum, Müller, Zool. Dan. ii. 12, t. 50. — Fabr. Fauna Grœnl. 394.
Buccinum striatum, Pennant, Brit. Zool. t. 74, fig. 91. — Lister, Conch. t. 962, fig. 15; An. Angl. t. 3, fig. 3.

Shell thick, ovate-conic, ventricose, grayish or brownish white, encircled with prominent, raised lines, from one fifth to one tenth of an inch apart, with minute, intervening striæ; with twelve or thirteen longitudinal, obliquely waved, elevated ribs or plaits, traversing the upper whorls, fading away on the convexity of the lower whorl, and generally disappearing entirely a short distance from the lip; a yellowish-brown, velvety epidermis covers the shell wholly, or near the lip; whorls six, regularly convex; aperture oval, about

one half the length of the shell, white within, or more frequently of a brilliant golden-yellow; minute striæ, corresponding to the prominent lines without, extend some distance within the mouth, and produce faint crenulations of the outer lip; this is somewhat everted, and arched so as often to produce a conspicuous notch at about its posterior third; columella broadly overlaid with callus, somewhat flattened, and twisted at its lower portion; not extending so far as the lip on the opposite side of the canal. Usual length, three inches; breadth, one and nine tenths inches.

Fig. 634.



B. undatum.

It is occasionally found on some of the rocky bars in Boston Harbor, particularly Faun Bar, of good size and beauty. On the sandy beaches it is thrown up, in a worn state. Still farther eastward it becomes abundant; and the finest I have ever seen were sent to me by Dr. Mighels, from the vicinity of Portland. I am not aware that it is found south of Cape Cod. Gull Island (*Smith*); whole coast of New England and Canada.

I have given a description of our *B. undatum*, as it most commonly appears with us. It differs, however, in several points from the English shells, as figured and described by Pennant and others. It is more ventricose, the whorls are one or two less in number; it is not found of so large a size, British specimens being mentioned four or five inches long, while the largest I have seen is only three inches and a half; the striation is far more conspicuous, and the remarkable projection of the columella beyond the rest of the shell, shown in foreign specimens, is not found in ours; the aperture is proportionally broader, and the ribs or folds less distinct. Its golden mouth, too, which is not found in foreign shells, renders it a beautiful shell. In truth, it much more nearly resembles Pennant's *B. striatum* ("Brit. Zool." pl. 74); but Turton states that, in the *B. striatum* (which is now regarded as a variety of *B. undatum*), the shell is much thinner than the true *B. undatum*, which is not the case in our shell.

Kiener observes that this species is very variable in size; also in its form, which is more or less inflated, sometimes the folds, then

the striæ, and then both disappearing. And were specific names to be given to every considerable variety, the nomenclature would be most unscientifically burdened.

The figure of Kiener, and the wood-cut in "Drummond's Letters." &c., are accurate representations of our shell.

Buccinum ciliatum.

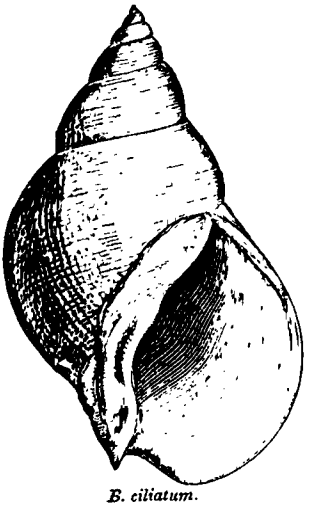
FIG. 209.

Shell ovate-conic, ventricose, thin; whorls six or eight, sometimes folded at the suture; spirally striated, ash colored, or clouded with brown; epidermis hispid.

Tritonium ciliatum, O. FABR. Fauna Grœnl. 401.
Buccinum ventricosum, KIENER, Species (*Buccinum*), pl. 3, fig. 7.
Buccinum ciliatum, GOULD, Inv. 1st ed. 307, fig. 209. — STIMPSON, Check Lists, 5.

Shell similar to *B. undatum*, but thin, paper-like, and destitute of folds, except short ones near the suture, so as to give that part a crenated appearance. The whorls are more convexly rounded, so as to be nearly cylindrical; surface with minute and close revolving lines, color yellowish, or livid, most specimens with blotches, or dashes of brown; epidermis fawn colored, and hispid, with short hairs, arranged for the most part along the lines of increase. Aperture short, rounded, lip very thin; throat pure white, or yellowish. The pillar has a very oblique, obscure fold. Length, two inches; breadth, one and three tenths inches; divergence, fifty-eight degrees.

Fig. 635.



B. ciliatum.

Taken from fishes caught, for the most part, at the Banks; fossil, Montreal (*Dawson*).

The thin structure, inflated form, and want of undulations, distinguish this species from the preceding. It agrees very accurately with the description of Fabricius; and Dr. Lovèn assures me that there can be no doubt of its being his *T. ciliatum*. As the epidermis is often removed, or rubbed, however, we do not always find it fringed with short hairs, "*ciliatus pilis brevibus*," as he describes it. Nor is it less doubtfully the *B. ventricosum* of Kiener, although we do not often find it clouded with blotches, or zigzag stripes, as he figures it.

Buccinum Donovani.

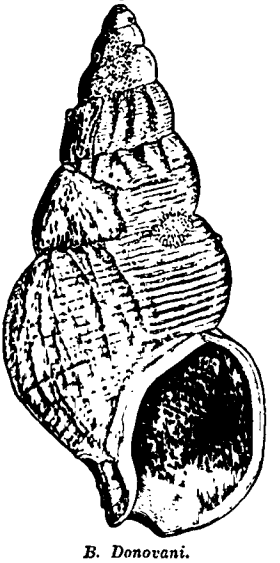
FIG. 208.

Shell ovate-conic, elevated and pointed; whorls folded lengthwise, and marked with revolving lines; the lowest whorl is encircled by a rounded carina; aperture rounded, lip spreading.

Buccinum glaciale, DONOVAN, Brit. Shells, v. pl. 154. — BROWN, Conch. of Great Brit. &c. pl. 49, figs. 12, 13.
Buccinum Donovani, GRAY, in Zool. to Beechey's Voyage, 128. — GOULD, Inv. 1st ed. 304, fig. 208. — STIMPSON, Check Lists, 5.

Shell ovate-conic, spire elevated and pointed, solid, of a livid brownish color, folded obliquely lengthwise, the lower whorl being merely plaited at the suture, and covered with rather coarse revolving lines; whorls seven or eight, moderately convex, and gradually tapering; on the lower one a flattish rib or keel commences at the junction of the lip, and, revolving, terminates about the lower third of the lip; suture deep and undulating; aperture less than one half the length of the shell, rounded, outer lip white, rather thick, and spreading, with a wave at its posterior portion; inner margin nearly destitute of callus; throat livid; canal short, very slightly recurved. Length, two inches; breadth, one and one tenth inches; divergence, forty-two degrees.

Fig. 638.



B. Donovani.

Inhabits the Bank fishing-grounds. St. Flavie, Canada (*Bell*).

Distinguished from *B. undatum* by its more slender form, greater polish, its rounded aperture, and spreading lip, and by the ribs encircling the larger whorl. None of the specimens exhibit more than one well-developed rib, and some of them are destitute of any. It has also a more elongated, and more acute spire, than *B. glaciale*, and Dr. Gray seems to have done well in separating it from that species, as it is commonly received. I have seen a few perfect specimens taken from fishes, which correspond accurately with Donovan's figure.

Buccinum cinereum.

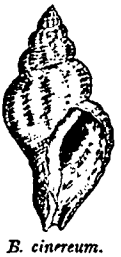
FIG. 213.

Shell oval, tapering at both ends, ash colored, or reddish-brown, with ten or twelve undulations on the lower whorl, crossed by numerous revolving lines.

Fusus cinereus, SAY, Journ. Acad. Nat. Sc. ii. 236 (1821); Amer. Conch. pl. 29. — DE KAY, N. Y. Moll. 145, pl. 8, fig. 184. — PHIL. Abbild. pl. 1, figs. 7, 8.
Buccinum plicosum, MENKE, Syn. 2d ed. 59 (1830). — GOULD, Inv. 1st ed. 303, fig. 213.
Rapana? cinerea, STIMPSON, Check Lists, 6.

Shell long-oval, tapering at both ends, coarse, solid, of a reddish-brown color, more or less dark, covered with an ashy-gray pigment; on some specimens are two faint brown bands on the larger whorl; whorls five or six, convex, compressed about the suture, with ten or twelve rib-like undulations along each, crossed by numerous, somewhat regular, elevated, revolving lines; aperture ovate, and, with the beak, about equals the spire; outer lip sharp, scalloped by the termination of the revolving lines, with one or more series of elevated, whiter lines within, corresponding to the external grooves; pillar margin slightly arched, covered with enamel, which rises up by the side of an umbilical depression; beak short, slightly curved; throat of various hues from light violet to dark chocolate; operculum horny, rounded ovate, elements concentric; the nucleus near one edge. Length, one inch; breadth, three fifths of an inch; divergence, fifty degrees.

Fig. 637.



B. cinereum.

Found on rocks in bays and inlets, about Nantucket, New Bedford, &c., and occasionally sheltered under the edges of stones in Boston Harbor. I am not aware that it is found to the north of Cape Ann, while it is common at the South, and grows to a much larger size. Vineyard Sound (*Desor*); Lynn Harbor (*Haskell*); St. Simon's Isle, Georgia (*Couper*).

Animal small, foot scarcely covering the aperture, very little dilated at the front angles, cream colored, margined with lemon color beneath, punctured with light drab above; siphon merely surpassing the tip of the canal; head scarcely protruded; tentacula nearly united at origin; eyes black, at the outer upper third of tentacula, which third is a mere filament, contractile. Motions sluggish.

Mr. Say noticed that its habits were those of *Purpura;* but it is removed from both *Fusus* and *Purpura* by its operculum, and will

probably prove to belong to the genus *Pollia* of Gray. Mr. Say's specific name is preoccupied by another species of *Buccinum*.

Family MURICIDÆ, Flem.

Shell with a canal, more or less extended, in front of the aperture, the outer lip of which does not alter its form by age.

Genus FUSUS, Lamarck. 1799.

Shell elongated, tapering to both ends, without varices; aperture oval, terminating in a straight or slightly curved canal; operculum horny, pear-shaped, with the nucleus at the small end.

Fusus Islandicus.

Shell elongated, bluish-white, covered with a horn colored epidermis; whorls eight, marked with equidistant, revolving lines; aperture as long as the spire.

Murex corneus, Pennant, Brit. Zool. iv. 124, t. 76, fig. 99. — Montagu, Test. Brit. 258. — Donovan, Brit. Shells, ii. pl. 38. — Turton, Conch. Dict. 89. — Dillwyn, Catal. ii. 733. — Wood, Index, pl. 27, fig. 107.

Murex Islandicus, Gmélin, Syst. 3555.

Fusus Islandicus, Martini, Conch. iv. 159, t. 141, figs. 1312, 1313. — Lam. An. sans Vert. 1st ed. vii. 126; 2d ed. ix. 450. — Brug. Encyc Méth. Vers. iii. 101, pl. 429, fig. 2. — Kiener, Species (*Fusus*), pl. 7, fig. 2. — Gould, Inv. 1st ed. 284 — De Kay, N. Y. Moll. 144, pl. 8, fig. 185. — Stimpson, Check Lists, 6.

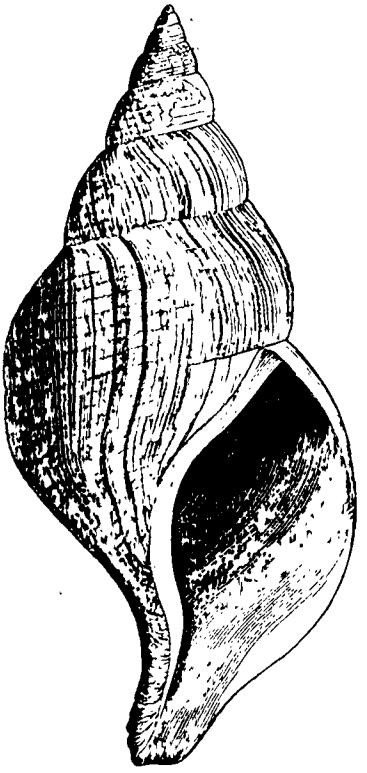
Fusus corneus, Say, Amer. Conch. pl. 29. — Fleming, Brit. Anim. 348. — Brown, Conch of Great Brit. &c. pl. 47, figs. 7, 9; Encyc. Brit. vi. 448.

Buccinum gracile, Da Costa, Brit. Conch. 124, t. 6, fig. 5.

Buccinum angustius, Lister, Conch. t. 913, fig. 5.

Shell ovate, elongated, bluish-white, ponderous, semi-transparent, covered with a horn colored, somewhat velvety epidermis; whorls eight or nine, moderately convex, somewhat compressed before the suture, the anterior whorl equalling two thirds the length of the shell; the whorls covered with equidistant, sub-equal raised revolving lines, quite apparent through the epidermis; lines of growth faint; suture distinct, somewhat channelled. Aperture oblong oval, half as long as the shell, polished, porcelain-white within; outer lip sharp, and minutely crenulated by the revolving lines; pillar smooth, and overspread with enamel; canal moderately produced, and gently curved backwards. Length, two and three fourths inches; breadth, one and one tenth inches; divergence, forty-five degrees.

Fig. 638.



F. Islandicus.

A deep-water shell. Very large specimens, much worn, are occasionally found upon Chelsea and Phillips's Beaches; along the coast of Maine, and farther eastward, they are not infrequent. The small variety is found abundantly in fishes caught in our harbor, though I have never found it washed ashore. Nova Scotia (*Willis*); Eastport (*Cooper*); St. Anne (*Bell*).

I formerly regarded the small shells as the young, or a dwarf variety of the type, though Mr. Sowerby is rather disposed to regard them as a good species. And I had also regarded the *Fusus ventricosus* as a variety *abbreviatus* of the same; but as I find it accurately described by Dr. Gray, I have concluded to follow him, since I can do it without imposing any new name. The true *Murex corneus* of Linnæus is said to be the *Fusus lignarius* of Lamarck.

Animal white, with small irregular specks of black; eyes black; foot rectangular, angles rounded.

Fusus pygmæus.

Fig. 199.

Shell not exceeding four fifths of an inch in length; whorls six, and preserving the proportions of *F. Islandicus*.

Fusus Islandicus, var. *pygmæus*, Gould, Inv. 1st ed. 284, fig. 199.
Fusus pygmæus, Stimpson, Check Lists, 6.

Both Dr. Mighels and Prescott having assured me that *F. pygmæus* is distinct from *F. Islandicus*, and having sent me specimens of the latter of equal length with those of the former, I find their opinion quite correct. *F. pygmæus* has at least two more whorls than the young of *F. Islandicus* of equal length. The comparative

length of the aperture is less; the epidermis is drab and strongly corrugated longitudinally, hirsute along the striæ, while that of *F. Islandicus* is horny, close, with the shell flesh-colored beneath, while that of *F. pygmæus* is always white. The striæ are more numerous and more rounded in *F. pygmæus*, those of *F. Islandicus* being more grooved as it were. In *F. pygmæus* the apex is regularly and acutely pointed, while in *F. Islandicus* we have the distorted button usually found in the young of large convoluted shells.

Fig. 639.

F. pygmæus.

Animal purest white, the red buccal mass showing through; foot large, broadly truncate before, but not at all auricled; broadly rounded behind, and its sides tending to fold over slightly. (*Stimpson.*)

Halifax (*Willis*); Eastport, and Grand Manan (*Stimpson*).

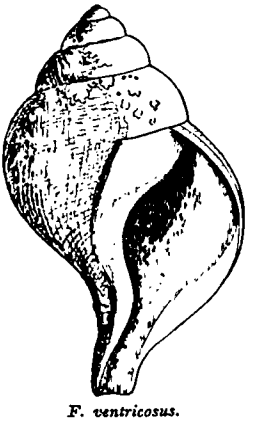
Fusus ventricosus.

Fig. 200.

Shell ovate-globose, bluish-white, covered with a thick epidermis; whorls five, marked with revolving lines; aperture longer than the spire.

Fusus Islandicus (var.), Kiener, Species, pl. 15, fig. 2.
Fusus ventricosus, Gray, in Zool. to Beechey's Voyage, 117. — Gould, Inv. 1st ed. 285, fig. 200. — De Kay, N. Y. Moll. 144, pl. 8, fig. 183. — Stimpson, Check Lists, 6.
Fusus corneus (var.)? Brown, Conch. of Great Brit. &c. pl. 47, figs. 11, 12.
Fusus striatus, of Paris collections, on authority of Mr. Sowerby. — Reeve, Con. Icon. pl. 11, figs. 42 *a*, *b*.

Fig 640.



F. ventricosus.

This species is closely allied to *F. islandicus* in color, marking, and texture. It is, however, much more ventricose, the last whorl composing nearly the whole shell. It maintains its proportions through all the sizes and ages I have seen. It is also shorter and finer lined than *F. Sabini*, Gray, found in the Arctic seas, to which Brown's figure perhaps applies more properly than to this species.

I have never seen it from any other locality than the Bank fishing-grounds, and this may add to its claims to be regarded as a distinct species. Length, one and seven tenths inches; breadth, one and one tenth inches; divergence, seventy-eight degrees. Sable Island (*Willis*).

The aperture is nearly twice as long as the spire, and the revolving lines are closer and more regular than in *F. Islandicus*.

The above name, applied to it by Dr. Gray, is perhaps not objectionable, though it was formerly applied to *Rostellaria curvirostris*.

Fusus tornatus.

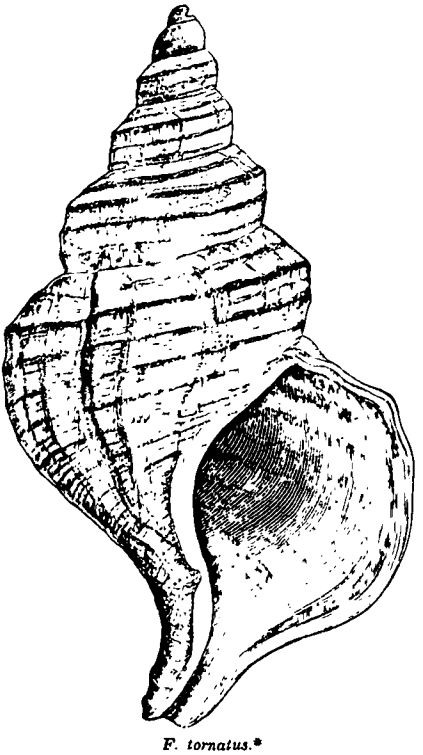
FIG. 201.

Shell turreted, coarse, pale-brownish; whorls eight, convex, encircled by elevated bands of a pale chestnut color; aperture rounded, canal short, and strongly recurved.

Fusus tornatus, GOULD, Sillim. Journ. xxxviii. 197; Inv. 2d ed. 286, fig. 201. — DE KAY, N. Y. Moll. 148. — STIMPSON, Check Lists, 6.

Shell turreted, rough, inelegant, antiquated, dingy white, or faint brownish horn color; whorls eight, very convex, rather ventricose, encircled by distant, elevated, light chestnut colored bands or ribs; on the upper whorls two of these lines, more prominent than the rest, give them a bicarinated appearance; on the last but one there are usually three lines, and on the lowest are several others, gradually diminishing in prominence, and never reaching the front, except in immature shells; sutural division abrupt; striæ of growth quite apparent, but, with these exceptions, the shell has a smooth and worn appearance; aperture rather less than half the length of the shell, broad oval, and somewhat dilated; outer lip sharp and somewhat angulated by the most prominent revolving bands; inner margin covered with a callus in mature shells; canal short, and very much re-

Fig. 641.



*F. tornatus.**

* The specimen figured is in the collection of E. R. Mayo, Esq. — W. G. B.

curved. Length, two and a half inches; breadth, one and one fourth inches; divergence, fifty degrees

From the Bank Fisheries. Taken from codfish. Several good specimens of various ages are now before me, for most of which I am indebted to the kindness of Colonel Totten. St. Anne (*Bell*); fossil, Montreal (*Dawson*).

This shell is undescribed, unless it be the much debated and equivocal *Murex despectus* of Linnæus, about which British writers seem to have been so much puzzled. It differs from the early state of the *Fusus antiquus* of Linnæus, the *F. despectus* of most British conchologists, in the more rounded form of the whorls, and in being destitute of the network formed by the close revolving and longitudinal striæ, and it would evidently never assume the appearance of a mature *F. antiquus*.

The only figures I have seen at all resembling this are figure 1295 of Martini, which he regards as a variety of *Murex antiquus*, as indeed he does the *M. despectus* of Linnæus also; and the figure of Donovan in his "British Shells," Vol. V. pl. 180, under the name of *Murex despectus*. I have very little doubt that it is the genuine *M. despectus* of Linnæus; but as another shell is now universally received under that name, it seems the most judicious way to apply a new name to this, with the above explanation.

This shell probably never becomes three inches in length. It is inelegant and coarse, in general smooth and somewhat shining, though seeming to be made up of small, plane surfaces, rather than curved ones. The elevated lines are broad, and smoothly rounded, of a darker color than the rest of the shell, and give it an appearance as though it might have been turned in a lathe, but left in an unfinished state. In general outline it very strongly resembles the fossil *F. contrarius* of the English crag formation.

Fusus decemcostatus.

FIG. 202.

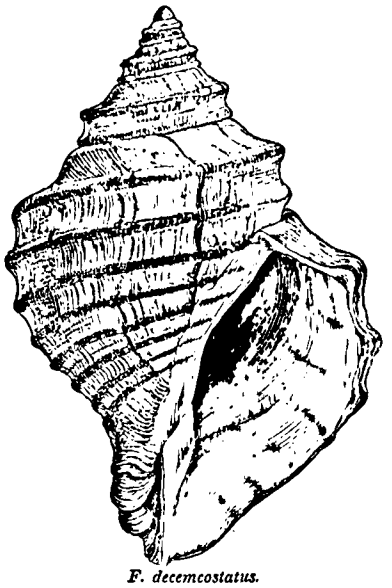
Shell oval, turreted, ash colored, with ten elevated, rounded, horn colored ribs on the lower whorl, and two on the upper ones.

Fusus decemcostatus, SAY, Journ. Acad. Nat. Sc. v. 214. — GOULD, Inv. 1st ed. 287, fig. 202. — DE KAY, N. Y. Moll. 145, pl. 9, fig. 196. — PHIL. Abbild. pl. 1, fig. 12. — STIMPSON, Check Lists, 6.

Fusus carinatus, KIENER, Species (*Fusus*), pl. 19, fig. 1.

Shell obliquely oval, narrowed at both ends, solid, coarse, spire elevated and turreted, ash colored, composed of about six convex whorls, coarsely wrinkled by the lines of growth; lower whorl turgid, and girdled by about ten broad, elevated, rounded ribs or keels, of a light reddish horn color; they are about equidistant, the posterior one is the largest, and the successive ones go on diminishing, till, about the beak, they become nearly extinct; between the posterior rib and the suture is a broad, excavated shoulder, giving the shell a turreted appearance; the two largest ribs revolve also on all the upper whorls; the space between the ribs is marked by fine revolving lines; aperture ovate; outer lip sharp, and modified by the termination of the ribs; inner margin regularly arched, and thinly spread with white enamel; the pillar, at its lower third, twists outwards to form a short, curved beak, and has, at this part, an imperfect umbilicus, bounded externally by a rough, obtuse spiral ridge; throat white, having shallow grooves of a chestnut color at the margin, answering to the external ribs; operculum horny. Length, three inches; breadth, one and three fourths inches; divergence, sixty-eight degrees.

Fig 642.



F. decemcostatus.

Thrown up after violent storms on the shores of Massachusetts Bay, and along more northerly coasts. It is seldom found with the mouth entire, though it may contain the living animal; showing that it probably inhabits rocks in deep water. Eastport (*Cooper*); fossil, Portland; Sable Island, &c. (*Willis*).

It resembles no other shell of the genus, unless, perhaps, it be *F. carinatus*, which is a more ventricose shell, with fewer and narrower ribs. But Kiener must be mistaken in regarding it as the *F. carinatus* of Lamarck. There is no reason to suppose that his *F. carinatus* was different from that of other authors, who give figures varying widely from our shell. Kiener's figure is taken from a small, slender specimen. It is still more like *Purpura succincta*, in

general aspect. It is subject to but little variation; the most important one is, that a third rib is found upon one or more of the upper whorls.

[Reeve has figured an undoubted specimen of this species, from Mr. Cuming's Cabinet, as the *Buccinum lyratum*, Martyn (*Murex Gm.*), and the *Murex glomus cereus* of Chemnitz, which the latter author gives as coming from King George's Sound, New Holland. His figure is much larger and more ventricose, and is beyond question a different species.

Genus TROPHON, Montfort. 1810.

Shell fusiform, varices numerous, lamelliform, or laciniated; spire prominent; aperture ovate; canal open, usually turning to the left; columella smooth, arcuated.

Trophon clathratus.

Fig. 198.

Shell small, brownish; whorls six, ventricose, ribbed lengthwise with numerous sharp raised plaits; aperture rounded; canal curved.

Murex clathratus, Lin. &c.
Murex Bamffius, Donovan, Brit. Shells, v. pl. 169, fig. 2. — Maton and Rackett, Lin. Trans. viii. 149. — Montagu, Test. Brit. Suppl. 117.
Fusus Bamffius, Fleming, Brit. Anim. 351. — Brown, Conch. of Great Brit. &c. pl. 47, fig. 1. — Gould, Inv. 1st ed. 289, fig. 198. — De Kay, N. Y. Moll. 148, pl. 36, fig. 339.
Trophon clathratus, Stimpson, Check Lists, 6.

Shell small, light brownish, composed of six rounded whorls, forming an elevated spire; suture deeply defined. The stages of growth are distinctly marked by an expansion of the lip, so as to cover the surface of the shell, lengthwise, with from fifteen to twenty sharp, raised folds, of a whitish color, which become rounded into brownish ribs by age; aperture less than half the length of the shell, rounded-ovate, terminating in a curved canal, about half as long as the aperture; lip sharp, direct, or reflexed, according to the stage of growth; aperture brown. Length, half an inch; breadth, nine fortieths of an inch; divergence, thirty-three degrees.

Fig. 643.

T. clathratus.

Occasionally found in the stomachs of fishes. Eastport (*Cooper*); Nova Scotia (*Willis*).

This is undoubtedly the *F. Bamffius* of English authors, as determined by actual comparison. But the similarity of this and the following species is such as to raise the question whether they are not the same. Their shape, color, number of whorls, and character of the surface is the same, and they scarcely differ in anything but size, this species being a miniature of the other. And yet there is a constancy in both, and none of those intermediate specimens of what mark the connection of distant varieties. I have no doubt that the large figure of Donovan, which represents what he regarded as a very large growth of his *M. Bamffius*, was taken from a specimen of what I have described as a new species. Brown seems to have copied that figure, but in such a way as to render it doubtful to which species his figure would best apply. I have never seen this species exceed three fourths of an inch in length; while my smallest specimen of *T. scalariformis*, an immature specimen, is more than an inch in length. It generally appears covered with an ash colored mouldiness, which disappears when moistened.

Trophon scalariformis.

FIG. 203.

Shell fusiform, white or reddish-brown, with fifteen or twenty longitudinal, compressed ribs; aperture of the length of the spire.

Fusus scalariformis, GOULD, Sillim. Journ. xxxviii. 197; Inv. 1st ed. 288, fig. 203. — DE KAY, N. Y. Moll. 143, pl. 8, fig. 182.
Trophon scalariformis, STIMPSON, Check Lists, 6.

Fig. 644.

T. scalariformis.

Shell tapering at both extremities, reddish-brown in the younger stages, white when old, whorls seven, turgid, covered at close intervals with fifteen to twenty compressed, white ribs, or arching plates, laying over each other like tiles; they are generally a little flexuous, the edges sharp and jagged when young, and more erect, smooth, and blunt on old specimens; they are usually somewhat more elevated at the posterior part of the whorls, so as to produce an angular or coronated appearance; the interstices, in adult shells, are smooth, somewhat wrinkled at the sutures, with numerous faint, revolving lines, which are not visible on younger shells; aperture half the length of the shell, produced into a moderately long,

slightly recurved beak, irregularly wrinkled by the transverse terminations of the ribs; right lip thickened or sharp, according as it is or is not terminated by a rib; throat light chestnut-brown, like the exterior of young shells. Length, one and three fourths inches; breadth, four fifths of an inch; divergence, forty-five degrees.

Of six specimens in my possession, four belong to Colonel Totten, who kindly sent them to me for description, one was from Dr. J. B. Forsyth of Sandwich, all of which were from the Bank Fisheries; and one was taken from a fish caught in Massachusetts Bay by Mr. Couthouy. Halifax (*Willis*); fossil, Montreal (*Dawson*); whole coast of Greenland (*Hayes*); Belfast Bay.

This shell is remarkable for its sharp elevated ribs, as if the surface were raised by flakes arranged like the ribs on most species of *Scalaria*. It is very much like the *Fusus Bamffius*, but, on the whole, I think it is different, inasmuch as we have that species with its undoubted characters, and the two never seem to run into each other. The large figure of Donovan ("Brit. Shells," pl. 169, fig. 1), given as *Murex Bamffius*, represents our shell.

It is allied to *M. Magellanicus;* and the figure in "Encyc. Méth." pl. 438, fig. 4, referred to as *M. lyratus*, Lamarck, bears a distant resemblance to it.

Trophon muricatus.

Shell slender, yellowish; whorls very tumid, with about ten conspicuous folds and elevated revolving lines; beak long and straight.

Murex muricatus, Montagu, Test. Brit. 262, pl. 9, fig. 2. — Turton, Conch. Dict. 95. — Maton and Rackett, Lin. Trans. viii. 149. — Dillwyn, Catal. 746. — Wood, Index, pl. 27, fig. 138. — Fleming, Brit. Anim. 351.

Fusus muricatus, Brown, Conch. of Great Brit. &c. 48, fig. 28. — Gould, Inv. 1st ed. 293.

Shell elongated, slender, yellowish-white, or orange, composed of seven very convex whorls, the suture deeply defined, forming an elevated, pointed spire; these are traversed by about ten broad, rounded folds or undulations which are crossed by coarse, elevated, revolving, glossy lines, producing a rough, granulated, almost tubercular surface; aperture broad oval, terminating in a long, straight canal, which together equal half the length of the shell; outer lip rendered jagged by the revolving lines, and sometimes greatly thick-

ened; inner margin smooth and simple. Length, seven tenths of an inch; breadth, three tenths of an inch; divergence, forty-five degrees.

Two shells answering to the preceding description were furnished me from the cabinet of Dr. Prescott, of Lynn, as taken from fish brought to Phillips's Beach. I had some little hesitation in admitting them as native shells, supposing they must have been accidentally mingled with Massachusetts shells. But I am now disposed to regard it as another of the shells belonging to both Atlantic shores. I take it to be the *M. muricatus* of Montagu, from whose figure our specimens differ only in wanting the thickened outer lip, a character which age would probably produce. I may, however, be deceived on both these points. It is readily distinguished by its long, straight beak, which brings it among the true *Fusi*.

Genus BUSYCON, Bolten. 1798.

Shell pear-shaped, without varices, broad at the spire, and tapering forwards to form a long, straight beak; aperture longer than the spire, broad behind; pillar twisted.

Busycon canaliculatum.

Fig. 206.

Shell large, pear-shaped, covered with revolving lines, and a hispid epidermis; lower whorl tumid, ending in a long canal, a nodular keel crowns the flattened summit of each whorl, and there is a deep and broad channel at the suture.

Murex canaliculatus, Lin. Syst. Nat. (12th ed.) 1222, No. 555. — Gmélin, 3544, No. 65. — Gualt. Test. t. 47, fig. A. — Martini, Conch. iii. t. 67, figs. 742, 743. — Lister, Conch. t. 878, fig. 2. — Knorr, Vergn. i. t. B. 6, fig. 4.

Pyrula canaliculata, Brug. Encyc. Méth. Vers. iii. 866, 436, fig. 3. — Lam. An. sans Vert. viii. 138; 2d ed. ix 504. — Adams, Bost. Journ. Nat. Hist. ii. 269. — Gould, Inv. 1st ed. 294, fig. 206. — De Kay, N. Y. Moll. 140, pl. ix. fig. 190. — Reeve, Icon. No. 27.

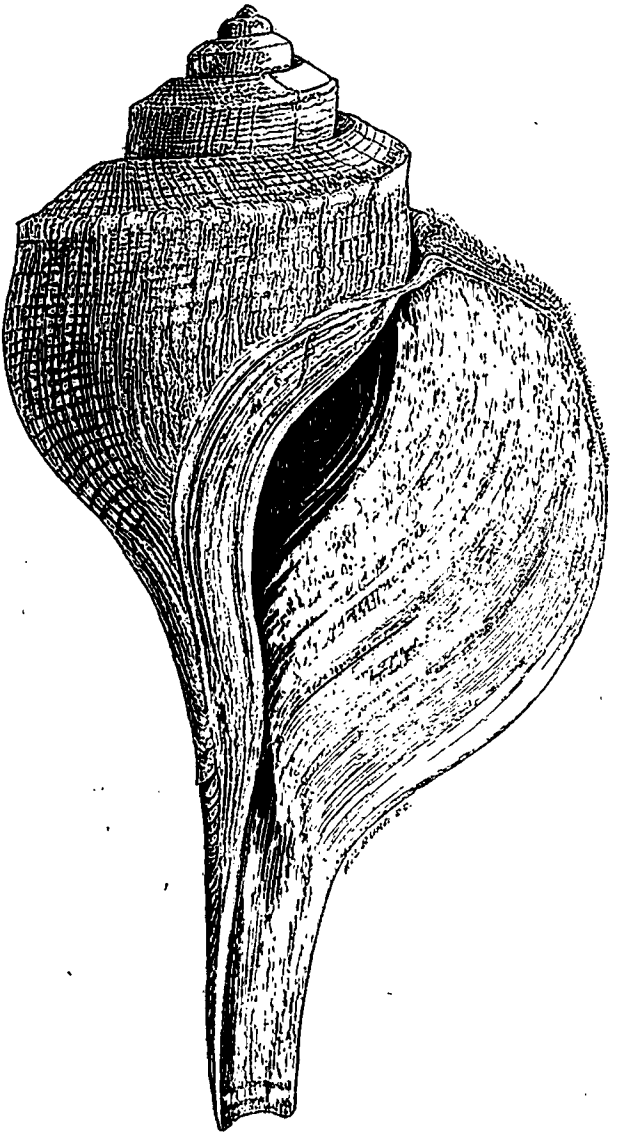
Pyrula spirata, Kiener. Species, pl. 10, fig. 1.

Busycon canaliculatum, Stimpson, Check Lists, 6.

Shell large, rather thin, pear-shaped; pale fawn color, coarsely marked with revolving lines; composed of about six turreted whorls, the last very large and tumid above, gradually diminishing downward, and terminating rather abruptly in a long, nearly straight canal or beak; a nodulous, beaded cord or keel surrounds the most

prominent part of each whorl, behind which it is abruptly flattened; at the suture is a broad and deep channel, so that the upper whorls

Fig. 615.



B. canaliculatum

are composed of an upright portion, and a nearly horizontal one, all terminating in a pointed apex, and forming a winding terrace

up the spire; covered with a dense yellowish-brown epidermis, bristling with stiff, curved hairs along the lines of growth, and at regular intervals corresponding with the revolving lines of the shell; aperture ovate, three fourths the length of the shell, the outer lip simple, sharp, and arched; the inner margin concave and twisted as it turns out to form the canal, smooth and enamelled; within, brightly polished, variously shaded with chestnut and fawn color; operculum small for the shell, oval, the apex at the lower extremity, its elements coarse, strengthened on the inner side by a varnished deposit. Ordinary length, six inches; breadth, three inches.

Found about Nantucket, Martha's Vineyard, Buzzard's and Narragansett Bays. It is set down, in all the works I have seen, as an inhabitant of the arctic seas and Canada. But Cape Cod is probably its northernmost limit; at least, I have never heard of it farther north. I believe, too, that it does not extend far south. Alive at Oysterville (*Haskell*); Fort Macon, Georgia (*Couper*).

It seems superfluous to be minute in the description of a shell which would at once be recognized, when we have said that it is a large, pear-shaped shell, with its peculiar channel at the suture, and each whorl crowned with a beaded circlet. It is subject, however, to considerable variations. It varies in color from light orange to livid-brown. In thickness, also, there is great diversity. In the old shells, the nodules, which are so regular in the young, are worn off, and they seldom exhibit more than vestiges of the bristled epidermis. The largest specimen I have seen is seven inches in length. Kiener, like his predecessors, has associated two shells under the same name, which are certainly distinct, and probably come from different quarters of the globe. Which should be held as the *M. canaliculatus* of Linnæus, must remain uncertain, since the essential character of his species is, a canal intervening between the whorls at the suture ("*quod anfractus in spirâ non contigui sunt, sed canali distantes*"), a character which belongs to both species. Gualter and Davila evidently had reference to our shell alone.

The ova are contained in membranous cases, about the size and thickness of a cent (of 1841). Great numbers of these are united together in a parallel position, about one fourth of an inch apart, by a ligamentous thong attached to their edge, so as often to form strings a yard in length, gradually diminishing in size from one end to the other. They are represented in "Ellis's Corallines,"

t. 33, fig. b. When the embryo is sufficiently mature, the young escape through an opening in the edge, opposite to that where the ligament is attached.

[Animal: foot very broad, rounded, obtuse behind, convexly truncate in front; sole orange color; above gray with dark gray and black spots and blotches. Mantle pale white with gray spots except at extremity above, which is deep black shading off to light gray towards posterior extremity. Head short, wider than neck. Tentacles vertically compressed, large, almost black, triangular-elongate; eyes very small, on offsets one third from head. Proboscis very long and large, white with gray maculæ; margin of mantle crenulate, pale; teeth yellow. Operculum, apex to posterior left corner of foot. In eating, applies end of proboscis to clam's foot, and with sudden jerk of lingual ribbon inward and sidelong, takes a strip of flesh. (*Stimpson.*)

Busycon carica.

Shell large, solid, pear-shaped, spire not turreted, suture not channelled, having a series of the triangular, compressed tubercles just above it, and encircling the most prominent part of the body whorl; canal long and flexuous.

Murex carica, Gmélin, 3545, No. 67 — Lister, Conch. 880, fig. 36. — Gualt. Test. t. 47, B. — Martini, Conch. 3, t. 69, figs. 744, 756. — Knorr, Vergn. vi. t. 27, fig. 1.

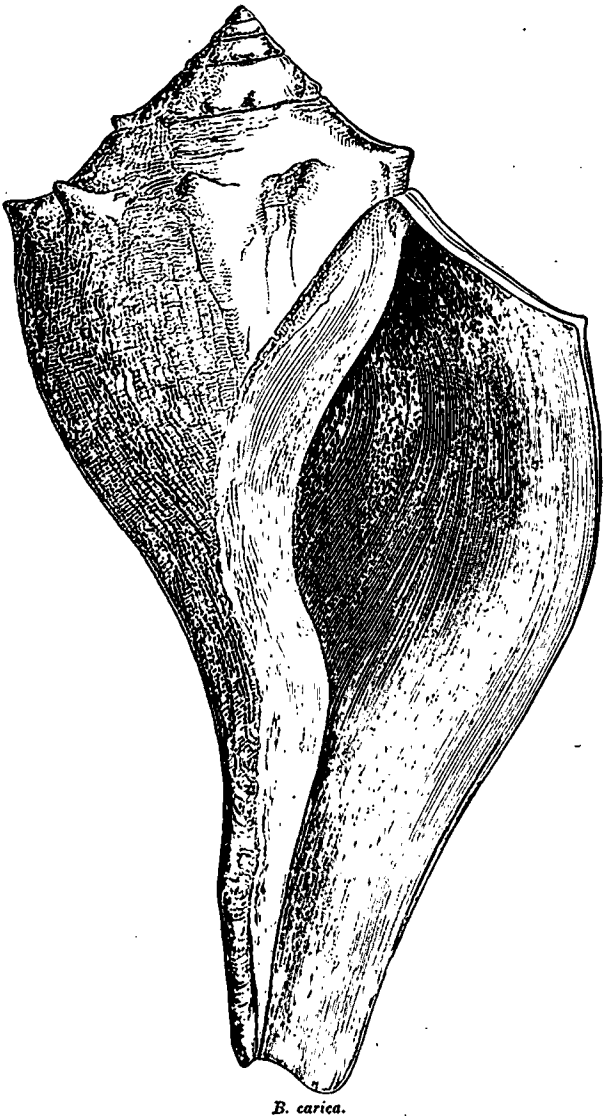
Pyrula carica, Deshayes, Encyc. Méth. Vers. iii. 866, pl. 433, fig. 5. — Lam. An. sans Vert. (1st ed.) vii. 138; 2d ed ix. 508. — Adams, Bost. Journ. Nat. Hist. ii. 269. — Gould, Inv. 1st ed. 296. — De Kay, N. Y. Moll. 141, pl. 9, figs. 192, 193.

Busycon carica, Stimpson, Check Lists, 6.

Shell large and thick, ovate pear-shaped, ash colored; whorls six, the lowest large and capacious, broadest at its posterior fifth where it is crowned by a series of compressed, triangular nodules, one at each stage of growth; the spire suddenly slopes backwards from these to the suture, which is well-defined, but not channelled; the spire is a low cone, pointed, the series of nodules encircling the base of each whorl; below the nodules the lower whorl gradually diminishes and extends into a long, conical beak; surface distinctly marked by an elevated ridge of a darker color at each stage of growth, and by revolving lines alternately larger and smaller; aperture long ovate, angular at its junction behind, where a canal is formed by a protuberance of the opposite margin; outer lip simple, sharp, regularly curved to the extremity of the beak, or slightly arched at the middle, not otherwise contracted at the commence-

ment of the canal; pillar lip flexuous, concave above, and to the beginning of the canal where it twists outwards, causing a bluntly rounded projection, and forming the inner margin of the canal,

Fig. 646.



B. carica.

which is gently curved upwards, and to the right; interior bright brick-red or light fawn color; operculum unguiform, apex at one

end, inner side of a wax-like texture, strengthened by an entire rim of a dark vitreous substance. Length, seven inches; breadth, four inches.

Found in company with the preceding, but less abundant. It is a shell belonging to a more southern latitude, and is found of great size, and deep color, on the southern coast of the United States.

This is the largest convoluted shell on this Atlantic coast, and is recognized without difficulty. Still it exhibits great variety in appearance, particularly in the length of the spinous tubercles. Sometimes they are half an inch in length, and at others, mere traces of them are all that is found on the larger volutions; sometimes they are close at the suture, even encroaching upon the whorl below; and at others, they are removed to a considerable distance above it. In the old shells the surface is a nearly uniform dead, ashy-gray color; while in the young there are stripes at each stage of growth, and imperfect bands of a violaceous-brown color. Southern specimens are more luxuriant, with more brilliant colors, as might be expected from a warmer climate.

Genus FASCIOLARIA, Lamarck. 1799.

Shell fusiform; spire acuminated; aperture oval, elongated, as long as the spire; siphonal canal straight; columella smooth, with a few oblique plaits at the fore part; outer lip internally crenate.

Fasciolaria ligata.

Shell elongate, fusiform, thick, reddish-fuscous, transversely ribbed; whorls six, convex; spire acuminate, suture strongly impressed; aperture ovate-elongate; lip crenate; columella with two folds.

Fasciolaria ligata, Mighels and Adams, Bost. Journ. N. H. iv. 51, pl. 4, fig. 17 (1842). — Stimpson, Check Lists, 6.

Fig. 647.

F. ligata.

Shell elongated, fusiform, rather thick, of a reddish-brown color, when fresh, covered with a thin and almost perfectly transparent epidermis; whorls six, well-rounded, and covered with six or seven equidistant, revolving, thread-like ribs, with grooves alternating; suture well-impressed; spire regularly tapering, pointed; aperture oblong-oval, polished; within of a bright reddish-brown color; canal rather narrow, nearly straight; labrum rather thin, crenulated by the ribs and grooves; columella arcuated above the middle, two distinct,

oblique, delicate folds above the commencement of the canal. Length, seven tenths of an inch; breadth, three tenths of an inch; divergence, forty-five degrees.

Mingan, in the Gulf of St. Lawrence, taken from the stomachs of codfish, by Mr. Foster, fisherman, in summer of 1841.

This remarkable and truly beautiful shell is not very nearly allied to any species with which we are acquainted, unless it be to that of *F. fusiformis*, Valenciennes, from New Holland. That species, however, is much larger than our shell, is much less regularly and strongly ribbed, and has a tooth-like process on the labium, of which our shell is destitute. We suppose this to be the first and only species of the genus that has ever been found on our coast. (*Mighels* and *Adams.*)

Halifax (*Willis*).

Genus RANELLA, Lamarck. 1812.

Shell oblong-oval, thick, nodulous, having a line of varices on each side, formed at each half revolution; aperture oval, terminating in a straight canal in front, and in a notch posteriorly; lip thickened.

Ranella caudata.

Fig. 204.

Shell rhomboidal, thick, cinereous brown, checkered with longitudinal ribs and revolving lines, canal long and straight.

Ranella caudata, Say, Journ. Acad. Nat. Sc. ii. 236 (1822); Amer. Conch. pl. 48. — Gould, Inv. 1st ed. 297, fig. 204. — Adams, Bost. Journ. Nat. Hist. ii. 269, — De Kay, N. Y. Moll. 139, pl. 8, fig. 176. — Stimpson, Check Lists, 6.

Fig. 648.

R. caudata.

Shell rhomboidal, solid, of a dark, mahogany color, obscured by a substance like bluish mould; there are five angular whorls, traversed lengthwise by eleven elevated ribs, of which one at the left side of the largest whorl, and the one bordering the aperture, are enlarged into strong, wing-like varices; these are crossed by equidistant, revolving threads, which together form a network over the shell; aperture inversely ovate, rounded behind, and pointed before; outer lip thick, margined within by thick granules which alternate with the external lines; pillar lip curved, flattened, and smooth, and, with the throat, is bluish-white; canal about the length of the spire,

straight, or a little recurved, narrow, deep, and partly closed over by the continued lips. Length, one inch; breadth, three fifths of an inch; divergence, sixty degrees.

Found sparingly on the shores of Buzzard's Bay, Nantucket, and Martha's Vineyard. According to Mr. Say, it is abundant on the Southern coast. It is the only species known on the coast of the United States, and, as a species, is peculiar on account of the prolongation of its canal.

Mr. Sowerby regards it as identical with *R. muriciformis*, Brod., from Western Columbia. The alliance is very close, but ours is a much more delicate shell. At any rate, Mr. Say's description was published ten years before that of Mr. Broderip.

[Animal: tube extends beyond the canal; foot light yellow; head and tentacles nearly white, siphon also; the whorls with white dots and mottlings; same at all ages; operculum chestnut.

Genus CERITHIOPSIS, Forbes. 1849.

Shell elongated, turreted; aperture short, oblong, oblique, terminating in front by a short, recurved canal.

Cerithiopsis Emersonii.

Fig. 180.

Shell long-conical, chestnut colored; whorls seventeen, flat, each encircled with three series of granules; canal less than half the length of the aperture.

Cerithium Emersonii, Adams, Bost. Journ. Nat. Hist. ii. 284, pl. 4, fig. 10. — Gould, Inv. 1st ed. 275, fig. 180.
Cerithiopsis Emersonii, Stimpson, Check Lists, 5.

Shell small, conical, elongated, glossy, reddish-brown, with a regularly granulated surface; whorls sixteen or seventeen, flattened, with a revolving series of bead-like granules at the upper and lower margins of each, and another intervening one, but nearer to the upper than to the lower series, and less prominent, commencing at ten or twelve whorls from the summit, and becoming more distinct as it approaches the base; in each series the granules are connected by a rather narrow, but elevated revolving line, nearly as high as the granules; they are also connected in a similar manner in a longitudinal direction; posterior edge of

Fig. 649.

C. Emersonii.

the whorls margined by a sharp ridge, of a darker color; suture profoundly impressed; the ridge terminates abruptly before, in a very short, twisted, wrinkled beak; aperture small, about one sixth the length of the shell; outer lip scalloped when perfect. Length, half an inch; breadth, one eighth of an inch; divergence, twenty-two degrees.

Obtained by Professor C. B. Adams, at Nantucket and in New Bedford Harbor, by whom it was described and named in honor of G. B. Emerson, Esq., President of the Boston Society of Natural History.

This prettily sculptured shell is distinguished by its short aperture and beak, its broad base, from which the flattened whorls regularly taper to an acute apex; and by the pretty strings of bead-like granules encircling it. These beads are sometimes so worn down as to present the appearance of a continuous line dilating at regular intervals.

This shell is unequivocally pronounced by Mr. Sowerby to be the *Murex tubercularis* of Montagu. But, after a careful examination of all the descriptions of that shell, I am led to conclude, either that I sent Mr. Sowerby a poor representation of our shell, or that he would decide differently on a second, more careful inspection. No author ascribes to *M. tubercularis* more than eight or ten volutions, and one fourth of an inch for its length; while ours has commonly twice that length, with sixteen or eighteen volutions. Montagu says, in his "Supplement," "It has as an invariable character, three series of tubercles *of equal size*, on each volution." But at the ordinary length of *M. tubercularis*, our shell has but two series of granules; and when the third appears, it is very perceptibly smaller than the other two series. On account of so decided a variation in size and sculpture, I think it proper still to regard our shell as a distinct species, trusting to future observations to settle the point definitely.

[Animal: foot somewhat long, truncate in front, palish with white maculations; neck flesh color in middle with white spots, a line of white on each side continued from tentacles inside of eyes. Head broad, truncate-rounded, dark flesh-color in front edge. Sole with white blotch in middle. Foot very small, notched posteriorly. (*Stimpson.*)

Cerithiopsis terebralis.

FIG. 181.

Shell conic-turreted; whorls ten, flattened, having three sharp, elevated, revolving ridges on each, with numerous fine, longitudinal lines between the ridges; canal very short.

Cerithium terebrale, ADAMS, Bost. Journ. Nat. Hist. iii. pl. 3, fig. 7. — GOULD, Inv. 1st ed. 276, fig. 181.
Cerithiopsis terebralis, STIMPSON, Check Lists, 5.

Shell small, elongated-conic, composed of ten or twelve flattened whorls, separated by a slightly excavated sutural region; color reddish-brown, with occasionally a whitish revolving band at the lower part of each whorl. On each whorl are three elevated, compressed, revolving ridges, at about equal distances from each other, and perhaps we may reckon a fourth, very small and bordering on the suture. The spaces between the ridges are regularly rounded out, and checked with crowded, minute, longitudinal lines, none of which cross the summits of the ridges. On the lower whorl are two additional ridges. The base of the shell is abrupt; the canal very short and small; the aperture oval, about one eighth the length of the shell. Length, half an inch; breadth, one eighth of an inch; divergence, twenty degrees.

Fig. 650.

C. terebralis.

Found by Mr. C. F. Shiverick, at New Bedford, and in its vicinity, below low-water mark.

This species is closely allied to *C. Emersonii*. Its size and proportions are the same; but it can scarcely be regarded as a variety. It is at once known by the prominent ridges, which resemble the threads of a screw. There is nothing like the nodulous surface of *C. Emersonii*, and the minute barring between the ridges is a striking arrangement, to which there is no approach in that shell.

[Animal whitish, front with broad white patches; tentacles whitish maculate; a white line continued from back on each side of neck. (*Stimpson.*)

FAMILY CANCELLARIIDÆ.

SHELL with a short, ascending canal, or an oblique notch, or semi-canal, directed upwards.

Genus TRICHOTROPIS, Brod. and Sowerby. 1826.

Shell thin, ventricose, keeled, umbilicated; aperture longer than the spire, compressed into a partial canal in front; epidermis horny, rising into hairs at the angles of the shell; operculum horny, nucleus at one side.

The genus *Trichotropis* was instituted by Mr. Sowerby to include this and one other shell, which have unequivocal generic traits, but whose place in the series has not yet been determined. Lesson regards it as allied to *Janthina;* and the species which he knew might well lead him to such an opinion. Mr. Sowerby at first compared it with *Turbo*, *Buccinum*, and *Cancellaria*. But in his late work, the "Conchological Manual," he places it among the *Purpuriferæ*, where its aspect would lead us to place it. It is very peculiar in having its axis fall considerably to the left of the canal.

Trichotropis borealis.

Fig. 207.

Shell ovate-rhomboidal; whorls four, the last very broad, and encircled by four or five, and the others by two prominent, fringed ribs, and crossed by minute and regular elevated lines; umbilicated.

Trichotropis borealis, Sowerby, Zool. Journ. iv. 373, pl. 9, figs. 6, 7. — Gould, Inv. 1st ed. 300, fig. 207. — De Kay, N. Y. Moll. 137, pl 8, fig. 178. — Stimpson, Check Lists, 6.
Trichotropis costellatus, Couthouy, Bost. Journ. Nat. Hist. ii. 108, pl. 3, fig. 2.

Shell ovate-rhomboidal, turreted, spire pointed; color ashy or yellowish-white; whorls four, separated by a deeply channelled suture; the last whorl very large, and encircled by two prominent, and two or three less conspicuous, rounded ribs or keels, and several still smaller intervening and adjacent ones; the two large ribs only are continued upon the upper whorls, which are thereby rendered angular; very numerous, minute, and regular threads traverse the length of the shell, not being interrupted by the ribs; the whole is covered by a yellowish horn colored epidermis, which rises like a bristly fringe along the keels, and along those lines which mark the stages of growth; aperture ovate, broad and rounded behind, narrowed and somewhat pointed in front; outer lip thin and sharp, festooned by the projecting ribs; inner lip arched and flattened, with a slight inward projection at the lower third, rising before the

Fig. 651.

T. borealis.

umbilicus, which is also bounded externally by a revolving ridge; the two lips meet in front at an acute angle, forming a short, slightly excavated canal, turning a little to the right. Length, seven tenths of an inch; breadth, four tenths of an inch; divergence, forty-eight degrees.

Found in considerable numbers, though rarely entire, in fishes taken in Massachusetts Bay. St. Anne (*Bell*); Eastport, twenty fathoms (*Cooper*); Halifax (*Willis*); fossil, Montreal (*Dawson*).

Mr. Couthouy makes the principal points of difference between his shell and the *borealis* of Sowerby to be, a greater number of keels on the lower whorl, the less breadth of that whorl, and the shorter fringe upon it. But these detailed portions are by no means constant. I have sent specimens to Mr. Sowerby, who assures me they are the same as his *borealis* received from Melville's Island, many years ago. He also sent another imperfect shell, dredged at Oban, in Argyleshire, by Mr. Jeffreys, and named by him *T. acuminatus*, which I cannot perceive to differ at all from our shell. This is probably its southern limit.

Genus ADMETE, Möller. 1842.

Shell ovate, turreted, cancellated; canal partial, very short or wanting; pillar plaited, the folds nearly transverse.

Admete viridula.

Fig. 190.

Shell ovate-conic, white, reticulated with coarse revolving lines, and lines of growth; three folds upon the pillar.

Tritonium viridulum, O. Fabricius, Fauna Grœnl.
Cancellaria buccinoides, Couthouy, Bost. Journ. Nat. Hist. ii. 105, pl. 3, fig. 3.
Cancellaria Couthouyi, Jay, Catal. of his Cabinet, 1839. — Gould, Inv. 1st ed. 283. — De Kay, N. Y. Moll. 188, pl. 7, fig. 160.
Admete viridula, Stimpson, Check Lists, 6.

Shell ovate-conical, somewhat turreted, milky-white, approaching to horn color; whorls five or six, convex, flattened at the top; suture well-defined, and sometimes profound; apex acute, the anterior whorl composing two thirds the length of the shell; surface marked with distinct lines of growth, and sometimes rising into folds near the suture; coarse revolving lines surround it, which, with the folds form a network; aperture half the length of the shell, oval; outer lip sharp,

Fig. 652.

A. viridula.

slightly crenulated by the revolving lines; inner lip arched with three inconspicuous, oblique folds, of which the middle one is largest; a thin coating of enamel spreads upon the anterior whorl in mature specimens; base sub-channelled. Length, eleven twentieths of an inch; breadth, seven twentieths of an inch; divergence, fifty-eight degrees.

Found in fishes taken in various parts of Massachusetts Bay, and usually occupied by a hermit crab. It is somewhat abundant. Cape Hope, James's Bay, 32° 10′, dead (*Drexler*); Eastport (*Cooper*); Banks (*Willis*).

It was first described by Mr. Couthouy* under the name of *C. buccinoides*, a name previously given to a species from the Pacific by Mr. Sowerby; on which account Dr. Jay has since applied to it the name of its first describer, — a merited compliment, but in conformity to what seems to me a very bad custom. It is not at first obvious to what genus this shell belongs; Mr. Sowerby coincides in the opinion that it is correctly referred to *Cancellaria*. He states, moreover, that he has for several years possessed it, brought from the Arctic seas. Hence, it is probably more abundant to the north of us. It varies considerably in its external appearance, from the greater or less prominence of the folds and striæ. A specimen belonging to Dr. Prescott, of Lynn, measures seven tenths of an inch in length, and four tenths of an inch in breadth. It somewhat resembles *C. australis*, Sowerby. This is the only species of the genus found in the Northern Atlantic, so far as I am aware.

Sub-Class PULMONIFERA.†

Breathing organ in the form of an air-sac or dorsal cavity, lined by a vascular network. Heart situated before the lung; abdomen rudimentary, or spiral and well-developed, usually protected by a shell. Sexes separate, or united in the same individual. Adult and larva shell-bearing; larva shaped like the parent, not furnished with cephalic fins.

Terrestrial or aquatic, respiring free air.

* It is now considered synonymous with *Tritonium viridulum* of Fabricius. — W. G. B.

† Dr. Gould had prepared nothing on this sub-class. I have introduced descriptions of additional species and added to the descriptions of the species included in the former edition by copying from the "Land and Fresh-water Shells of North America," Part I. and Part II., prepared for the Smithsonian Institution. Professor Henry has authorized the use of woodcuts intended for those works, and Mr. E. S. Morse has furnished many used by him in the "American Naturalist." — W. G. B.

Order GEOPHILA.

Eyes at the tips of elongated, cylindrical peduncles; tentacles retractile or contractile, cylindrical, shorter than and placed under the eye-peduncles, sometimes very small or wanting; operculum never present in the adult. Animal usually terrestrial.

Family HELICIDÆ.

Lingual membrane with numerous similar, transverse rows of teeth. Jaws smooth, striated or ribbed, with or without a central projection on its concave margin; single, or composed of numerous separate plates. Body elongate, attached its whole length to the upper surface of the foot, or more or less spiral and prominent on the middle of the upper surface of the foot. Eyes at the end of long, cylindrical, retractile peduncles; tentacles shorter, retractile, sometimes wanting. Mantle thin, small, discal or spiral, on the middle of the back; respiratory orifice sub-central, on the right side. Foot narrow, elongate, without a distinct locomotive disk, simple posteriorly. Vent near the respiratory orifice, central. Orifice of reproductive organs usually below the respiratory orifice or behind the right eye-peduncle.

Shell very variable in form, sometimes rudimentary and internal.

Genus VITRINA, Drap. 1801.

Shell imperforate, pellucid, glassy, depressed; spire short, whorls two to three, rapidly increasing, the last dilated; aperture ample, peristome thin, often membraneous.

Animal, body elongated, limaciform; mantle covering the back and neck, and extending to the base of the eye-peduncles, with one or more processes or prolongations of its margin, which are reflected upon the shell; tentacles very short. Respiratory orifice in the mantle, behind its usual position in the *Limaces*. Generative orifice behind and below the eye-peduncle. Jaw arcuate, concave margin with a median beak-like projection. Lingual membrane with long slender teeth, centrals tricuspid, laterals bicuspid, in

straight transverse series; uncini long, curved, thorn-shaped, bidentate, in a curved transverse series, and diminishing in size as they pass off laterally.

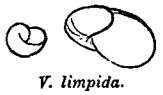
Vitrina limpida.

Shell globose-discoid, thin, fragile, transparent, shining; whorls two and a half to three; aperture large, sub-ovate; lip thin, acute; imperforate.

Vitrina pellucida, ADAMS, Shells of Vermont, 162 (1842). — DE KAY, N. Y. Moll. 25, pl. 3, fig 42 (1843), not of MÜLLER. — BINNEY, Terr. Moll. ii. 55, pl. 67 *a*, fig. 1 (1851).
Vitrina Americana, PFEIFFER (Dec. 1852), Proc. Zool. Soc. 156; in CHEMNITZ, 2d ed. 9, pl. 1, figs. 22–25 (1854).
Vitrina limpida, GOULD, in AGASSIZ, Lake Superior, 243 (1850); Terr. Moll. l. c. — PFEIFFER, Malac. Blatt. ii. 10 (1856); Mon. Hel. Viv. iv. 798. — W. G. BINNEY, Terr. Moll. iv. 33. — REEVE, Con. Icon. 62. — MORSE, Journ. Portl. Soc. i. 11, pl. 5, fig. 17 (1864); in Amer. Nat. i. 314, fig. 20 (1867). — TRYON, Am. Journ. Conch. ii. 243, pl. 3, fig. 1 (1866).

Shell globose-discoid, thin, fragile, transparent, shining; whorls two and a half to three, scarcely convex, with very minute lines of increase, the last whorl large and much expanded; suture not much impressed, sometimes with an impressed line revolving near it; aperture large, sub-ovate, somewhat diminished by the intrusion of the penultimate whorl; peristome thin and acute, the columella margin a little reflected; axis imperforate. Greatest transverse diameter nearly six millimetres.

Fig. 653.



V. limpida.

Animal whitish, grayish, or blackish, large compared with the shell. Head, eye-peduncles, and eyes black; tentacles very short. The prolongation of the mantle extends from under the shell, over the back and neck to the base of the eye-peduncles, but is unattached and free; from the right side of the mantle posteriorly, there arises a tongue-shaped process, which is reflected back upon the shell, and reaches to the spire. Respiratory foramen in the posterior part of the mantle.

Found in Maine, Vermont, New Brunswick, and to the northwest of Lake Superior. An accidentally introduced colony has lately been found by Dr. Lewis at Mohawk, New York.

Genus HYALINA, (FÉRUSSAC) GRAY. 1840.

ANIMAL as in *Helix*.

Shell generally umbilicated, thin, shining, greenish or reddish horn color; whorls five to seven, regularly increasing, the last not de-

scending, generally anteriorly dilated; spire depressed, very rarely orbicularly-conic, aperture roundly lunate; peristome thin, acute, straight. Jaw simple (neither furrowed nor dentate), arcuate, its lower edge acute, with a rostriform projection in the middle. Lingual membrane with central tricuspid teeth, a few bicuspid laterals in a straight row, and numerous thorn-shaped, curved uncini in a curving transverse series, modified greatly in size as they pass off laterally.

Hyalina cellaria.

FIG. 104.

Shell orbicular, depressed, thin, pellucid, glistening, smooth; whorls five, flattened; aperture rounded; lip simple; umbilicus deep.

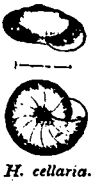
Helix cellaria, MÜLLER, Hist. Verm. ii. 28. — PFEIFFER, Mon. Hel. Viv. i. 111. — BINNEY, Bost. Journ. iii. 421; Terr. Moll. ii. 230, pl. 29, fig. 4. — GOULD, Inv. 180, fig. 104, excl. syn.? (1841). — DE KAY, N. Y. Moll. 37, pl. 3, fig. 35 (1843). — LEIDY, in Terr. Moll. U. S. i. 233, pl. 7, fig. 1 (1851), Anat. — W. G. BINNEY, Ter. Moll. iv. 111.

Hyalina cellaria, MORSE, Journ. Portl. Soc. i. 12, figs. 18, 19; pl. 5, fig. 20 (1864); Amer. Nat. i. 541, fig. 29 (1867). — TRYON, Am. Journ. Conch. ii. 249, pl. 3, fig. 19 (1866).

Helix glaphyra, SAY, Nich. Encycl. Am. ed. pl. 1, fig. 3: BINNEY's ed. 7, pl. 69, fig. 3. — EATON, Zool. Text Book, 194. — BLAND, N. Y. Lyc. Ann. vi. 352, not of PFEIFFER, REEVE, DESHAYES.

Shell small, orbicular, depressed, concave beneath, thin, pellucid, smooth, and glistening; whorls five, slightly convex, with minute, almost imperceptible lines of growth, otherwise highly-polished; color light greenish, horn colored above, drab colored beneath, or milky-white. Aperture rounded, but broader than high; lip simple, very thin and sharp; base elegantly rounding into a rather large and deep umbilicus. Diameter rather less than half an inch.

Fig. 654.



H. cellaria.

Animal has its upper surface light indigo-blue, darkest on the head, neck, and eye-peduncles, collar greenish, eyes black; foot narrow and slender, not much exceeding in length the diameter of the shell, and terminating acutely.

Found in gardens, damp cellars, about cisterns, and similar moist and fertile localities.

This species is common in damp cellars in Boston, and was noticed during 1862 in Providence, Salem, Lynn, Marblehead, Portland, and Halifax. Linsley includes it in his list of Connecticut shells. In 1864 it was found at Astoria, Long Island, New York.

There can be no doubt that the *H. glaphyra* of Say is identical with the *H. cellaria* of Müller; a comparison of shells of the same size and growth showing them to be absolutely similar in every respect. It was probably imported from Europe, as it may have easily been, about water-casks, greenhouse plants, &c.

The shell which is very commonly found marked as *H. glaphyra* is the *H. inornata*, Say, in an immature state. This is a less delicate shell, but in its earlier stages, when there is but a small umbilicus, there is no inconsiderable resemblance between the two, and it would accord well with the description; but no one familiar with the present species would ever mistake one for the other.

Hyalina arborea.

FIG. 110.

Shell small, orbicular, depressed, thin, pellucid, shining; brownish horn colored; whorls four, minutely wrinkled; aperture rounded; lip simple; umbilicus open.

Helix arborea, SAY, Nich Encyc. pl. 4, fig. 4. — BINNEY's ed. 5, pl. 72, fig. 5 (1817, 1818, 1819). — EATON, Zool. Text Book, 193 (1826). — BINNEY, Bost. Journ. Nat. Hist. iii. 422, pl. 22, fig. 1 (1840); Terr. Moll. ii. 235, pl. 29, fig. 3. — DE KAY, N. Y. Moll. 30, pl. 2, fig. 10 (1843). — GOULD, Inv. 182, fig. 110 (1841). — ADAMS, Vermont Moll. 160 (1842). — PFEIFFER, Mon. Hel. Viv. i. 95. — CHEMNITZ, 2d ed. ii. 114, t. 5, figs. 33–35. — REEVE, Con. Icon. 733. — W. G. BINNEY, Terr. Moll. iv. 116. — MORSE, Amer. Nat. i. 512, fig. 30 (1867).

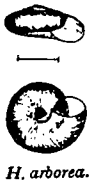
Helix Ottonis, PFEIFFER, olim, Wiegm. Arch. 1840, i. 251. — BINNEY, Terr. Moll. ii. 238, pl. 29*a*, fig. 3. — W. G. BINNEY, Terr. Moll. iv. 117.

Hyalina arborea, MORSE, Journ. Portl. Soc. i. 14, fig. 28; pl. 6, fig. 29 (1864). — TRYON Am. Journ. Conch. ii. 251, pl. 3, fig. 17 (1866).

Hyalina Ottonis, TRYON, Am. Journ. Conch. ii. 251, pl. 4, fig. 26 (1866).

Shell small, orbicular, slightly elevated, the apex a little depressed, concave beneath, brownish horn colored, smooth, thin, fragile, pellucid, shining; whorls five, slightly rounded above, separated by a well-impressed suture, marked with very fine lines of growth, more decidedly wrinkled at the suture; beneath very smooth, regularly rounding into a moderately large, deep, and well-developed umbilicus; aperture rounded; lip simple and thin. Diameter commonly one fifth of an inch, sometimes one fourth.

Fig. 655.



H. arborea.

Animal has the head and eye-peduncles blackish, upper parts bluish, posterior parts whitish, transparent. Foot thin and narrow.

A very common species, always to be found about decaying stumps, old logs, &c. It is found from Labrador to Texas, and on

the Rio Chama in New Mexico; from Florida to Great Slave Lake; also in Washoe County, Nevada; in Montana and California. It is also said to occur in Cuba, and in Guadaloupe.

This shell has very little to distinguish it except its very simple structure. It is like *H. cellaria* except in its smaller size. *Helix indentata* has also a similar size and external appearance; but is known by its distant, impressed, radiating lines. Férussac supposed it to be a variety of *H. lucida*, Drap.; but our shell has the umbilical region more excavated, and the umbilicus larger; there is also one whorl less in shells of the same size, so that the surface appears less crowded. The aspect of the two shells, on comparison, is sufficiently diverse. *H. electrina* has also one whorl less, and has a much more polished appearance.

Occasionally a thickening of the shell seems to take place at intervals, so as to produce an opaque appearance.

Hyalina electrina.

Fig. 111.

Shell small, depressed, pellucid, fragile, amber colored; whorls four, conspicuously wrinkled by the lines of growth; aperture rounded; lip simple; umbilicated.

Helix electrina, Gould, Inv. 183, fig. 111 (1841). — Binney, Bost. Journ. Nat. Hist. iii. 423, pl. 22, fig. 2 (1840); Terr. Moll. ii. 286, pl. 29, fig. 1. — De Kay, N. Y. Moll. 30 (1843). — Adams, Vermont Moll. 161 (1842). — W. G. Binney, Terr. Moll. iv. 117. — Morse, Amer. Nat. i. 542, fig. 31 (1867).

Helix pura, Alder, teste Pfeiffer, Mon. Hel. Viv. iv. 83.

Helix Janus, Adams, (olim) Shells Vt. Am. Journ. Sc. [1] xl. 273 (1841).

Zonites radiatulus, Reeve, Br. Land and Fr. Sh. 50, fig. (1863).

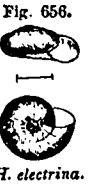
Zonites striatula, Moquin-Tandon, Moll. Fr. teste Reeve.

Helix viridula, Menke, Syn. Meth. 2d ed. 127; see also Mal. Blatt. viii. 92.

Hyalina electrina, Morse, Journ. Portl. Soc. i. 13, fig. 23; pl. 6, fig. 24 (1864). — Tryon, Am. Journ. Conch. ii. 251, pl. 4, fig. 25 (1866).

In the size, depressed-conical shape of the upper surface, the number of whorls, and the rapid enlargement of the lowest whorl, this shell corresponds with *H. indentata*. It differs in its darker, smoky horn color, its constant umbilicus, its rather thick and shining lip, and its whitish wrinkles, which, instead of being remote, are crowded as in other species. From *H. arborea* it differs in having one whorl less, the last one dilating; its apex not being depressed, its thinner, more shining structure, and its somewhat smaller umbilicus. In *H. arborea* the outer lip has a flexuous curve, but is

Fig. 656.



H. electrina.

nearly a direct section of the whorl in this. Though all of the same size and general appearance, the three may be readily separated, when seen in company. Indeed, its claims as a distinct species are not very obvious without viewing the three together. It may be briefly described by saying that it resembles *H. indentata* above, and *H. arborea* beneath.

This shell was first discovered by Mr. T. J. Whittemore, about the borders of Fresh Pond, in Cambridge, where it has since been found abundantly by him and by myself, under fragments of board in damp places, near the water's edge, in company with *H. chersina* and *Pupa modesta*. I have never seen it in company with either *H. indentata* or *H. arborea;* and it seems to differ widely from them in its habits, in thus preferring the vicinity, and even the intrusion, of water. Professor Adams informs me that he has selected numerous specimens of this species from among small snails collected by him in Missouri.

It occurs from Great Slave Lake to the Gulf of Mexico. Also in Europe, as is now generally believed, having been referred to *H. viridula*, Menke.

Hyalina indentata.

FIG. 109.

Shell orbicular, depressed, very thin and shining; whorls four, the external one marked with rather distant impressed lines radiating from the closed umbilicus; lip simple.

Helix indentata, SAY, Journ. Acad. ii. 372 (1822); BINNEY's ed. 24. — BINNEY, Bost. Journ. Nat. Hist. iii. 415, pl. 22, fig. 3 (1840); Terr. Moll. ii. 242; pl. 29, fig. 2. — DE KAY, N. Y. Moll. 31, pl. 3, fig. 26 (1843). — GOULD, Inv. 181, fig. 109 (1841). — ADAMS, Vermont Moll. 160 (1842). — CHEMNITZ, 2d ed. i. 21, pl. 34, figs. 12–15. — PFEIFFER, Mon. Hel. Viv. i. 59. — REEVE, Con. Icon. 730 (1852). — W. G BINNEY, Terr. Moll. iv. 119. — MORSE, Amer. Nat. i. 413, fig. 28 (1867).

Hyalina indentata, MORSE, Journ. Portl. Soc. i. 12, fig. 21; pl. 2, fig. 11; pl. 5, fig. 22 (1864). — TRYON, Am. Journ. Conch. ii. 246, pl. 3, fig. 11 (1866).

FIG. 657.

H. indentata.

Shell small, orbicular, very low conical, thin, pellucid, very light horn color, highly polished and shining; whorls four, slightly convex, the whole spire having a conical slope from the apex to the edge; the outer one rapidly increasing, marked with somewhat remote, sub-equidistant impressed lines, in the direction of the lines of growth, the intervening spaces very smooth; suture moderately deep; aperture large, well-rounded; lip simple; base having the

umbilical region deeply excavated, but not perforated, with very few exceptions, the lip usually terminating at the central point. Diameter one fifth of an inch, sometimes more.

Animal bluish-black upon the upper parts; margin and posterior extremity lighter.

Found in company with *H. arborea* and *H. striatella*, about decaying stumps and logs. At Oak Island, in Chelsea, I have found it abundantly. It inhabits all of Eastern North America, having been found from Canada to Texas and from Dacotah to Florida. It is also said to occur in St. Domingo.

This species is of about the same size as *H. arborea*. Its color is much lighter, its apex less depressed, its whorls less in number by one, the outer whorl increases much more rapidly, its umbilicus is usually closed; and, moreover, the impressed lines, which look like water lines, or the lines on a gooseberry, apparently radiating from the umbilicus, are entirely characteristic, and distinguish it from every other species. They are not readily discerned without a magnifier.

Hyalina minuscula.

Shell depressed-convex, whitish; whorls four; aperture nearly circular; lip simple; umbilicated.

Helix minuscula, Binney, Bost. Journ. Nat. Hist. iii. 435, pl. 22, fig. 4 (1840); Terr. Moll. ii. 221, pl. 17 *a*, fig. 2, excl. syn. — Adams, Vermont Moll. 161 (1842). — Chemnitz, 2d ed. ii. 112, t. 85, figs. 20–23. — Pfeiffer, Symbol. ii. 33; Mon. Hel. Viv. i. 114. — Reeve, Con. Icon. 731 (1852). — W. G. Binney, Terr. Moll. iv. 102. — Morse, Amer. Nat. i. 543, fig. 35 (1867).

Helix minutalis, Morelet nec Fér. Test. Nov. ii. 7.

Helix apex, Adams, Cont. Conch. 36. — Reeve, l. c. 339.

Helix Lavelleana, D'Orbigny, Moll. Cuba, in text, 161, excl. pl. (1853).

Helix Mauriniana, D'Orbigny, l. c. in pl. 8, figs. 20–22, excl. text.

Pseudo-hyalina minuscula, Morse, Journ. Portl. Soc i. 16, fig. 34; pl. 7, fig. 35 (1864). — Tryon, Am. Journ. Conch. ii. 264, pl. 4, fig. 62 (1866).

Shell umbilicated, minute, depressed-convex; epidermis whitish; whorls four, convex, not increasing rapidly in diameter, with microscopic wrinkles; suture very distinctly impressed; aperture nearly circular, peristome thin, acute; umbilicus large, not spread, deep, and exhibiting the volutions; base rounded, columella with a thin callus. Greater diameter two and a half, lesser two and one third, height one millimetres.

Fig. 658.

H. minuscula.

From the Red River of the North to Texas and Florida. It may

thus be said to inhabit all Eastern North America; has been lately found in California, and is quoted from Bermuda, Cuba, Jamaica, and Porto Rico.

Hyalina Binneyana.

Shell sub-globose, transparent, shining; whorls about four; aperture sub-circular; lip simple; umbilicated.

Hyalina Binneyana, MORSE, Journ. Portl. N. H. Soc. i. 13, figs. 25, 26; pl. 6, fig. 27; pl. 2, fig. 9 (1864). — TRYON, Am. Journ. Conch. ii. 252, pl. 4, fig. 31 (1866).*
Helix Binneyana, MORSE, Amer. Nat. i. 542, fig. 32 (1867).

Fig. 659.

H Binneyana.

Shell umbilicated, sub-globose, transparent, almost colorless, shining, smooth, with microscopic wrinkles of growth and still more delicate oblique wrinkles; spire not much elevated; whorls about four, rounded, gradually enlarging, the last globose, broadly umbilicated below; aperture oblique, sub-circular, large; peristome simple, acute, extremities not approaching, that of the columella sub-reflected. Greatest diameter four, height two millimetres.

Southern part of Maine; also Tawas Bay, Michigan.

Hyalina exigua.

Shell depressed, greenish horn colored; whorls three and a half; aperture transversely rounded; lip simple; umbilicated.

Helix exigua, STIMPSON, Proc. Bost. Soc. iii. 175 (1850). — GOULD, Terr. Moll. iii. 16. — W. G. BINNEY, Terr. Moll. iv. 102, pl. 77, fig. 19. — PFEIFFER, Mon. Hel. Viv. iii. 102. — MORSE, Amer. Nat. i. 543, fig. 34 (1867).
Helix annulata, CASE, in Sillim. Journ. [2] 1847, iii. 101, fig. 13; Ann. and Mag. Nat. Hist. 1847, 338, preoccupied. — PFEIFFER, Mon. Hel. Viv. iii. 103.
Helix striatella, junior, teste GOULD, Sillim. Journ. iii. 276 (1847).
Pseudo-hyalina exigua, MORSE, Journ. Portl. Soc. i. 16, pl. 2, fig. 8; pl. 7, fig. 33 (1864). — TRYON, Am. Journ. Conch. ii. 265, pl. 4, fig. 57 (1866).

Shell broadly umbilicated, depressed, pellucid, greenish horn color, marked with delicate revolving lines, and distant longitudinal ribs obliquely decussating the incremental striæ; spire scarcely

* In "Am. Journ. Conch." i. 188, Mr. Tryon proposes for this species the specific name *Morsei*, on account of *Helix Binneyana*, Pfeiffer. I have retained Morse's name, as it is not preoccupied in the genus *Hyalina*. In his first catalogue of Maine Shells Mr. Morse uses the name *Binneyi*, which can be employed if necessary to distinguish the shell from Pfeiffer's. — W. G. B.

elevated, apex free from striæ; whorls three and a half, convex, the last rounded, widely umbilicated below; aperture oblique, transversely rounded, remote from its axis; peristome simple, acute, its columellar extremity not reflected. Greater diameter two and a half, height one half, millimetres.

Fig 660.

Surface of *H. exigua.* Enlarged.

Fig. 661.

H. exigua. Enlarged.

Canada, New York, and New England; also Tawas Bay, Michigan.

Hyalina milium.

Shell depressed, transparent, shining; whorls three; aperture sub-circular; lip simple; widely umbilicated.

Helix milium, Morse, Proc. Bost. Soc. vii. 28 (1859). — W. G. Binney, Terr. Moll. iv. 101, pl. 79, figs. 4, 5. — Morse, Amer. Nat. i. 543, fig. 36 (1867).
Striatura milium, Morse, Journ. Portl. Soc. i. 18, figs. 41, 42; pl. 7, fig. 43 (1864).
Pseudo-hyalina milium, Tryon, Am. Journ. Conch. ii. 265, pl. 4, fig. 56 (1866).

Shell widely umbilicated, depressed, transparent, shining white, with a greenish tinge, marked with distinct and regular striæ of growth and microscopic revolving lines, the latter more conspicuous below; spire but slightly elevated; whorls three, rounded, rapidly increasing, the last planulate above, widely umbilicated below; aperture very oblique, sub-circular, remote from the axis; peristome simple, acute, its terminations somewhat approached, that of the columella not reflected. Greater diameter one and a half, height one half millimetres.

Fig. 662.

H. milium. Enlarged.

The surface of the shell is raised in numerous folds, frequently anastomosing; longitudinal ribs reticulate the surface and render the folds so crenulated that in certain lights the shell appears as if ornamented with strings of beads. This peculiar character disappears at the base of the shell, and is replaced by revolving lines and regular lines of accretion.

Massachusetts and Maine. It is quoted doubtfully from California by Cooper.

Hyalina ferrea.

Shell depressed-globose, transparent, not shining; whorls three; aperture large; peristome simple; umbilicated.

Striatura ferrea, Morse, Proc. Portl. Soc. i. 17, figs. 36–40; also pl. 2, fig. 10 (1864).

Hyalina ferrea, TRYON, Am. Journ. Conch. ii. 253, pl. 4, fig. 32 (1866).
Helix ferrea, MORSE, Amer. Nat. i. 544, fig. 37 (1867).

Shell umbilicated, depressed-globose, transparent, of a very light steel gray color, not shining, marked with very delicate incremental wrinkles and microscopic revolving lines; spire slightly elevated; whorls three, rounded, the last rapidly enlarging, globose; aperture large, transversely sub-circular; peristome simple, acute, its extremities not approaching, that of the columella scarcely sub-reflected. Greatest diameter two and a half, height one and one fourth millimetres.

Fig. 663.

H. ferrea.

Maine.

Hyalina chersina.

FIG. 105.

Shell minute globose-conic, pellucid, very smooth and shining; whorls six, suture deep; aperture narrow; lip simple; umbilicus closed.

Helix chersina, SAY, Journ. Phila. Acad. ii. 156 (1821); BINNEY'S ed. 18, 81. — BINNEY, Bost. Journ. Nat. Hist. iii. 416, pl. 26, fig. 3 (1840); Terr. Moll. ii. 243, pl. 17, fig. 4. — GOULD, Inv. 1st ed. 185, fig. 105 (1841). — ADAMS, Vermont Moll. 162 (1842); Sillim. Journ. [1] xl. 273. — DE KAY, N. Y. Moll. 44. pl. 35, fig. 338 (1843). — W. G. BINNEY, Terr. Moll. iv. 119. — MORSE, Amer. Nat. i. 544, fig. 38 (1867).

Helix egena, SAY, Journ. Phila. Acad. v. 120 (1825); BINNEY'S ed. 30. — DE KAY, N. Y. Moll. 45 (1843). — CHEMNITZ, 2d ed. i. 237, pl. 25, figs. 19–21? (1846). — REEVE, Con. Icon. No. 1263 (1854). — PFEIFFER, Mon. Hel. Viv. i. 31; not of GOULD in Terr. Moll.

Helix fulva, DRAPARNAND teste MIGHELS (Bost. Journ. iv. 333); CHEMNITZ; PFEIFFER, Mon. i. 30; REEVE, FORBES and HANLEY.

Conulus chersinus, MORSE, Journ. Portl. Soc. i. 19, figs. 44–46; pl. 2, fig. 4; pl. 7, fig. 45 (1854).

Conulus chersina, TRYON, Am. Journ. Conch. ii. 256, pl. 4, fig. 37 (1866).

Shell minute, sub-globose-conic, thin, pellucid, very smooth and shining, of a smoky horn color; whorls separated by a deep suture, and so crowded that they appear much higher than broad, and present an elevated, somewhat turreted spire, with a rounded apex; they are so smooth that scarcely any traces of the lines of growth are visible; aperture semi-lunar, narrow, much higher than broad, of about an equal width above and below; lip simple; base convex, umbilical region indented, but closed. Diameter about one tenth of an inch; height somewhat less.

Fig. 664.

H. chersina.

Found abundantly about the margin of Fresh Pond, under fragments of wood, in company with *Succinea ovalis*, *Pupa modesta*,

&c., and also in moist beds of leaves in forests. It is not rare in Vermont, and Mr. Say originally found it in Georgia. Common to the boreal regions of the three continents. It appears to inhabit all of Eastern North America, having been found from Great Slave Lake to Texas and Florida. Dr. Newcomb catalogues it among the species found at Lake Tahoe, California.

This is a very well-marked shell, not liable to be confounded with any other species except *H. labyrinthica*, which is of about the same size and shape. But the coarsely wrinkled surface of the one, and the polished, highly reflecting surface of the other, are distinctions which strike the eye at once; if anything further is needed, the parallel ridges within the mouth of *H. labyrinthica* will put the question beyond a doubt. When viewed from above, its numerous, narrow, accurately adjusted volutions render it a very beautiful object.

Hyalina minutissima.

Shell sub-globose, reddish horn color, shining; whorls four, convex; aperture sub-circular; peristome simple; umbilicated.

Helix minutissima, Lea, Tr. Am. Phil. Soc. ix. 17; Proc. ii. 82 (1841); Obs. iv. 17 (1844). — Troschel, Ar. f. Nat. 1843, 124. — Pfeiffer, Mon. Hel. Viv. i. 87. — W. G. Binney, Terr. Moll. iv. 100, pl. 77, figs. 6, 7. — Morse, Am. Nat. i. 546, fig. 45 (1867).

Helix minuscula, teste Binney, Terr. Moll. ii. 221.

Punctum minutissimum, Morse, Journ. Portl. Soc. i. 27, figs. 69, 70; pl. 8, fig. 71 (1864).

Conulus minutissima, Tryon, Am. Journ. Conch. ii. 257, pl. 4, fig. 63 (1866).

Shell umbilicated, sub-globose, reddish horn color, shining, marked with strong transverse striæ and microscopic revolving lines, both most prominent near the umbilicus; whorls four, convex, gradually increasing, the last broadly umbilicated; aperture sub-circular, oblique; peristome simple, acute, its columellar extremity sub-reflected. Greater diameter one and a half mill.; height, one millimetre.

Fig. 665.

H. minutissima.

Maine, Massachusetts, New York, Ohio.

Jaw * composed of sixteen long, slender corneous laminæ, recurved at their cutting edges, these plates partially lapping over each other.

Lingual membrane with fifty-one arched rows of 13 - 1 - 13

* The character of the jaw would place the species in the sub-family *Orthalicinæ*, as a distinct genus, for which Mr. Morse's name *Punctum* might be retained, otherwise the species would be placed in *Hyalina*.

teeth. Plates long and narrow, becoming narrower as they approach the sides of the membrane. Plates transparent. Denticles light horn color, central plate largest with one small rounded denticle, laterals with two equally short rounded denticles, those on the verge of the membrane having three minute denticles.

Hyalina multidentata.

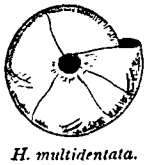
Shell depressed, pellucid; whorls six, narrow, slightly convex; aperture semi-lunate, narrow; peristome acute; two or more rows of minute teeth within; umbilicus very small.

Helix multidentata, BINNEY, Bost. Journ. Nat. Hist. iii. 425, pl. 22, fig. 5 (1840); Terr. Moll. ii. 258, pl. 48, fig. 3. — ADAMS, Vermont Moll. 161 (1842). — CHEMNITZ, 2d ed. ii. 202, pl. 101, figs. 9–12. — PFEIFFER, Mon. Hel. Viv. i. 184. — W. G. BINNEY, Terr. Moll. iv. 123. — REEVE, Con. Icon. No. 729. — MORSE, Amer. Nat. i. 543, fig. 33 (1867).

Hyalina multidentata, MORSE, Journ. Portl. Soc. i. 15, fig. 31; p. 61, fig. 30; pl. 6, fig. 32 (1864).

Gastrodonta multidentata, TRYON, Am. Journ. Conch. ii. 258, pl. 4, fig. 43 (1866).

Fig. 666.



H. multidentata. Enlarged.

Shell umbilicated, depressed, sub-planulate above, very thin, pellucid; epidermis smooth; shining; whorls six, narrow, slightly convex, increasing but slowly in diameter, delicately striated, beneath smoother; suture impressed; aperture semi-lunate, narrow; peristome acute; umbilicus very small, rounded, pervious, base convex, indented around the umbilicus; two or more rows of very minute white teeth, radiating from the umbilicus, are seen through the shell, within the base of the last whorl. Greater diameter, three and one fourth mill.; lesser, three mill.; height, one and a half millimetres.

Maine, Vermont, New York, Ohio; also Lower Canada.

There are from two to four rows of very minute delicate white teeth, on the lower side of the interior of the last whorl, radiating from the centre. One row is usually so near the aperture as to be seen within it with the aid of a microscope; the others are more or less remote; each row contains from five to six distinct teeth. They are visible through the shell.

Hyalina lineata.

FIG. 103.

Shell small, discoidal, green; whorls four, with fine, elevated, parallel revolving lines; aperture narrow, semi-lunar; lip simple; throat with two or more pairs of teeth; umbilicus broad and deep.

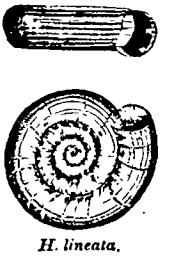
Helix lineata, Say, Journ. Phila Acad. i. 18 (1817); ii. 273 (1824); Nich. Encyc. 3d ed. iv. (1819); Binney's ed. 7, 24. — Binney, Bost. Journ. Nat. Hist. iii. 436, pl. 22, fig. 6 (1840); Terr. Moll. ii. 261, pl. 48, fig. 1. — De Kay, N. Y. Moll. 44 (1843). — Gould, Inv. 179, fig. 103 (1841). — Adams, Vermont Moll. 161 (1842). — Férussac, Tab. Syst. 44; Hist. pl. 79, fig. 1. — Deshayes in Fér. i. 80. — Chemnitz, 2d ed. ii. 203, t. 101, figs. 13–15. — Pfeiffer, Mon. Hel. Viv. i. 184. — Reeve, Con. Icon. 724 (1852) — W. G. Binney, Terr. Moll. iv. 123. — Morse, Amer. Nat. i. 546, fig. 44 (1867).

Planorbis parallelus, Say? Journ. Phila. Acad. ii. 164 (1821); ed. Binney, 63.

Helicodiscus lineata, Morse, Journ. Portl. Soc. i. 25, figs. 61, 62; pl. 2, fig. 3; pl. 8, fig. 63 (1864). — Tryon, Am. Journ. Conch. ii. 264, pl. 4, fig. 60 (1866).

Shell minute, discoidal, flat above, concave beneath, greenish; whorls about four, flat above, higher than broad, separated by a distinctly impressed suture, covered with numerous, parallel, raised, revolving lines; otherwise smooth; aperture narrow, semi-lunar; lip simple and thin; umbilicus wide and deep, exhibiting each volution to the apex. Within the aperture, on the external wall, are placed two pairs of white conical teeth, the first pair in sight on looking into the aperture, the other more remote, and seen only through the semi-transparent shell. Diameter, one eighth of an inch, usually less.

Fig. 667.



H. lineata, Enlarged.

Animal whitish, transparent, thread-like.

It has been noticed, for the most part, under the bark, or in the interstices, of rotten wood; sometimes under stones and leaves in damp places. Inhabits all of Eastern North America, having been found from Gaspé to Texas; also on the Rio Chama, New Mexico.

At first sight one would be disposed to call this shell a *Planorbis* rather than a *Helix*. Perhaps it is the *P. parallelus* of Say. Its wheel-shaped form, greenish color, revolving raised lines, and singular teeth, are characters which cannot be mistaken. One pair of these teeth may always be found and seen; and in one instance Dr. Binney noticed even a third pair still farther within the whorl.

Genus MACROCYCLIS, Beck. 1837.

Shell thin, widely umbilicated, depressed, striate or wrinkled, color uniform; whorls four and a half to five, the last broad, depressed, moderately deflexed in front, aperture obliquely ovate; peristome somewhat thickened or expanded, the margins approximating, the basal shortly reflexed.

Animal (of *M. concava*), upper surface grayish; eye-peduncles long, slender, bluish, base dirty white, color reddish-orange, posterior extremity slightly tinged with the same; foot narrow, twice as long as the diameter of the shell, tail pointed, scarcely reaching behind the shell; other characters as in *Helix*. Carnivorous.

Jaw crescentic, ends sharply pointed, anterior surface striated; concave margin smooth, with a median projection.

Lingual membrane with numerous arched rows of aculeate, recurved, thorn-like uncini; centrals simple, conical, pointed; laterals wanting; 23–1–23 teeth in each transverse row.

Macrocyclis concava.

Shell depressed, whitish or greenish horn colored; whorls five, finely striate; aperture rounded; peristome sub-reflected; umbilicus wide and deep.

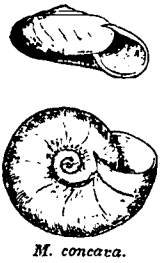
Helix concava, Say, Journ. Acad. ii. 159 (1821); Binney's, ed. 20. — Binney, Bost. Journ. Nat. Hist. iii. 372 (1840), excl. pl.; Terr. Moll. ii. 163, pl. 21. — Adams, Vermont Moll. 159 (1842), excl. Syn. *Vancouverensis*. — De Kay, N. Y. Moll. 33, pl. 2, fig. 15 (1843). — Pfeiffer, Mon. Hel. Viv. iv. 159. — W. G. Binney, Terr. Moll. iv. 65. — Leidy, Terr. Moll. U. S. i. 258, pl. 12, figs. 9–11 (1851), anat. — Morse, Am. Nat. i. 412, figs. 26, 27 (1867).

Helix planorboides, Férussac, Hist. t. 82, fig. 4. — Pfeiffer, Mon. Hel. Viv. i. 200; Symbolæ, ii. 37; Chemnitz, 2d ed. ii. 164, pl. 95, figs. 17–19; pl. 154, fig. 45 (1851). — Reeve, Con. Icon. 674 (1852). — Deshayes in Fér. i. 87.

Helix dissidens, Deshayes in Fér. Hist. i. 97, pl. 84, figs. 1, 2.

Macrocyclis concava, Morse, Journ. Portl. Soc. i. 12, pl. 5, fig. (1864). — Tryon, Am. Journ. Conch. ii. 245, pl. 3, fig. 8 (1866).

Fig. 668.



M. concava.

Shell depressed, very slightly convex on the upper surface; epidermis whitish horn color, sometimes with a tinge of green; whorls five, above flattened, below rounded, finely striate obliquely, and sometimes with microscopic revolving lines, the outer whorl spreading a little towards the aperture; suture rather deeply impressed; umbilicus wide, deep, exhibiting all the volutions to the apex; aperture rounded, somewhat flattened above, its edge frequently tinged with reddish-brown; peristome sub-reflected at its columellar extremity, simple above, and in some specimens considerably depressed near its junction with the outer whorl; columella with a thin callus, the edge of which connects the upper and lower extremities of the peristome. Greater diameter, twenty-one mill.; lesser, sixteen mill.; height, seven millimetres.

Canada to Georgia, Michigan to Missouri; also the post-pleiocene of the Mississippi Valley.

Genus LIMAX, Lin. 1740.

Body lessening towards the posterior extremity, which terminates in a point. Back with a carina or keel when contracted, convex when extended. Integuments with longitudinal elongated glands, and anastomosing furrows arranged in the same manner upon both sides. Mantle anterior, oval, marked with fine concentric striæ, or prominent wrinkles, unattached and free at the front and sides, but connected with the body at its posterior part, and containing in this part a testaceous rudiment or shell. Locomotive disk not expanded at margin, having a narrow band running longitudinally along its centre, and separated from the sides by a well-defined line or furrow. Respiratory orifice near the posterior margin of the mantle, large. Anal orifice immediately adjacent to, but a little above and anterior to the respiratory orifice, with a cleft or fissure through the mantle from the orifice to its edge. Orifice of organs of generation near and immediately behind the right superior eye-peduncle.

Testaceous rudiment thin, concentrical, not spiral, covered above with a thin and transparent periostraca, below smooth.

Jaw without ribs or marginal denticulations, its concave margin with a median projection.

Lingual membrane very broad, teeth long, central tricuspid, laterals of the same shape, but bicuspid; uncini aculeate.

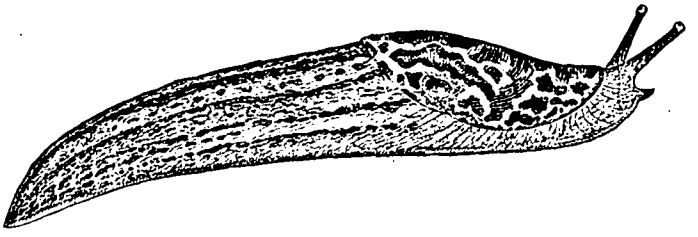
Limax maximus.

Limax maximus, Lin. Syst. Nat.
Limax antiquorum, Férussac, Podr. 20; Hist. 68, pl. 4, pl. 8 A, fig. 1.

Color light brown or ashen with alternate longitudinal rows of round spots, and uninterrupted stripes of black along the back and sides, replaced by irregular blotches on the mantle; lighter on the sides, dirty white below; eye-peduncles and tentacles short, blackish. Body elongated, terminating in a well-marked dorsal carina; covered with coarse, elongated, longitudinal tubercles; constantly exuding mucus from its whole surface, giving a vermicular, glistening effect. Mantle large, bluntly oval, with tuberosities more

delicate and arranged concentrically; orifice of respiration very large at its hinder lateral portion. Foot with a narrow locomotive disk. Length about four inches.

Fig



L. maximus.

A specimen of this common European slug was found in Newport, R. I., in a garden, by Mr. Samuel Powel (1868). It is figured above. This species has also been recently noticed in Philadelphia by Mr. Tryon ("Am. Journ. Conch." iii. 315), and in Brooklyn, N. Y., by Messrs. Sanderson Smith, and Prime. It is an introduced species. Its rich brown or black stripes giving it a leopard-like appearance, and its great size at once distinguish it from any species hitherto known to inhabit Eastern North America.

Limax agrestis.

Color varying from whitish to black and yellowish to rather brown, sometimes irregularly spotted with black; body cylindrical, elongated, terminating acutely; mantle oblong-oval, rounded at both extremities; foot narrow, base sallow-white.

Limax agrestis, LINNÆUS, Syst. Nat. [x.] 1758, i. 652. — MOQUIN-TANDON, REEVE, &c. — BINNEY, Bost. Journ. Nat. Hist. iv. 166 (1842); Terr. Moll. ii. 37, pl. 64, fig. 2 (1851). — LEIDY, Terr. Moll. U. S. i. 250, pl. 2, figs. 7–9 (1851), anat. — DE KAY, N. Y. Moll. 20, pl. 1, fig. 4 (1843). — MORSE, Journ. Portl. Soc. i. 7, pl. 3, fig. 2 (1864).

Limax tunicata, GOULD, olim, Inv. 3 (1841).

Color varying from whitish through every shade of cinereous and gray to black, and through various shades of yellowish, or amber color, to brownish, and sometimes irregularly spotted with small, black points or dots; eye-peduncles darker than the general surface, sometimes black; mantle sometimes mottled with a lighter color; base of foot sallow-white; sheath of eye-peduncles indicated by black lines extending

Fig 670.

L. agrestis.

backwards from their base under the edge of the mantle. Body when in motion cylindrical, elongated, terminating acutely, the sides towards its posterior extremity compressed upwards, so as to form a short carina or keel; foot very narrow. Mantle oblong-oval, fleshy, convex, and prominent, rounded at both extremities; equalling in length one third of the length of the body, its surface marked by prominent, irregularly waved, concentrical lines and furrows, having their centre on the posterior part, and its edges free throughout the whole circumference. Upper surface of the body marked with longitudinal lines, or shallow furrows, darker than the general surface, sometimes black, anastomosing with each other, and forming a sort of network; between the reticulated lines are narrow, irregular oblong plates, or smooth flattened tubercles, giving the surface the appearance of mosaic work, with lines of dark cement; reticulations less distinct on the sides, and disappearing towards the base; a prominent tubercular ridge extends from between the eye-peduncles backward to the mantle, with a furrow on each side. Eye-peduncles cylindrical, about one eighth of the length of the body, with small, black, ocular points on the superior part of the terminal bulb; tentacles immediately below, very short. Respiratory foramen near the posterior lateral edge of the mantle, large, surrounded with a whitish border. Orifice of rectum immediately adjacent, but a little above and anterior to the respiratory foramen. Foot narrow; locomotive band bounded by two distinct longitudinal furrows. Generally about twenty-five mill. in length, but when fully grown nearly fifty millimetres.

It is undoubtedly of European origin, inhabiting Boston, New York, Philadelphia, and other maritime cities of the Atlantic coast. Also in Greenland. It is common in the neighborhood of Boston, under stones at roadsides, and about stables and farm-yards, and in other moist situations, under wet and decaying pieces of wood. It is also found in cellars and gardens, and causes some mischief by its depredations. A considerable number of individuals often congregate in the same retreat. Their food appears to be the green leaves of succulent plants, and sometimes ripe fruits; they feed during the night, and are rarely found out of their retreat in the daytime.

Limax campestris.

Color of various shades of amber, sometimes blackish, without spots; body cylindrical, elongated, terminating in a short carina; mantle oval, fleshy; foot narrow, whitish.

Limax campestris, BINNEY, Proc. Bost. Soc. 1841, 52; Bost. Journ. Nat. Hist. iv. 169 (1842); Terr. Moll. ii. 41, pl. 64, fig. 3. — ADAMS, Vermont Moll. 163 (1842). — DE KAY, N. Y. Moll. 22 (1843). — LEIDY, Terr. Moll. U. S. i. 250, pl. 2, fig. 56 (1851) anat.

Color usually of various shades of amber, without spots or markings, sometimes blackish; head and eye-peduncles smoky; body cylindrical, elongated, terminating in a very short carina at its posterior extremity; mantle oval, fleshy, but little prominent, with fine, concentrical lines; back covered with prominent elongated tubercles and furrows; foot narrow, whitish; respiratory foramen on the posterior dextral margin of the mantle; body covered with a thin, watery mucus. Length about twenty-five millimetres.

Fig. 671.

L. campestris.

Inhabits all the New England, Middle, and Western States, and is probably widely diffused through the country.

The resemblances between some of the species of this genus are so great that it is difficult to provide them with distinctive characters, and it is only by close comparison that their differences can be seen. The present species, although considerably smaller, is nearly allied to *Limax agrestis*. Its differential characters are as follows: It is always much smaller, and at all ages possesses a peculiar gelatinous or semi-transparent consistency. The tuberosities of the surface are more prominent in proportion to their size, are not flattened or plate-like, and are not separated by darker colored anastomosing lines, the intervening furrows being of the same color as the general surface. It does not secrete a milky mucus at every part of the surface when touched. Like that species, it is active in its motions, and suspends itself by a thread of mucus.

This species appears to be common to all the northern parts of the United States. It is found under decaying wood in the forests and in open pastures, and under stones at roadsides. From its wide distribution, it would seem to be indigenous.

Its testaceous rudiment is minute and delicate in proportion to the small size of the animal.

Limax flavus.

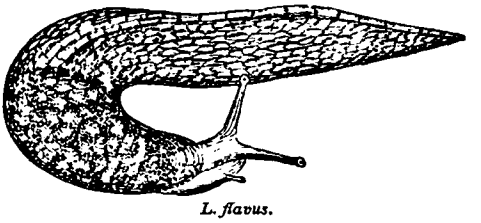
Color brownish, with oblong-oval uncolored spots; body cylindrical, elongated, terminating with a short prominent keel; mantle oval, rounded at both ends, with rounded spots; base of foot sallow-white.

Limax flavus, LINNÆUS, Syst. Nat. [x.] 1758, i. 652 (not MÜLLER, 1774). — BINNEY, Bost. Journ. Nat. Hist. iv. 164 (1842). — DE KAY, N. Y. Moll. 21, pl. 1, fig. 5 (1843). — GRAY, PFEIFFER, REEVE, &c.

Limax variegatus, DRAPARNAUD, Tabl. Moll. 103 (1801). — FÉRUSSAC, MOQUIN-TANDON. — BINNEY, Terr. Moll. ii. 34, pl. 65, fig. 1 (1851). — LEIDY, Terr. Moll. U. S. i. 248, pl. 1 (1851), anat.

Color brownish, yellowish-brown, or ashy-brown, with oblong-oval, uncolored spots, which have a longitudinal disposition; mantle with rounded spots; head, neck, and eye-peduncles blue, semi-transparent; tentacles white; base of foot sallow-white. Body when extended cylindrical, elongated, terminating acutely with a short but prominent keel; upper part covered with long and narrow prominent tubercles. Mantle ample, oval, rounded at both ends, with numerous very fine concentrical striæ. Sides paler, and without spots. Respiratory foramen large, placed near the posterior lateral margin of the mantle and cleft to the edge. Generative orifice indicated by a white spot a little behind the eye-peduncle of the right side. Length, when fully extended, usually about seventy-five mill.; an individual kept in confinement with abundance of food attained the length of nearly one hundred and twenty-five mill., and several others that of two hundred millimetres.

Fig. 672.



L. flavus.

An introduced species, noticed hitherto in Massachusetts at Boston and Cambridge; in the cities of New York, Philadelphia, and Baltimore; in Virginia at Richmond, and at the University of Virginia, and at other cities. It is also found in Europe, Syria, and Madeira.

Genus HELIX, LIN. 1758.

BODY elongated, semi-cylindrical, tapering to a point posteriorly, convex above, plane beneath, the whole area forming a locomotive disk; integument reticulated by furrows; mantle simple, not extending beyond, and accurately fitting to the peristome of the shell, into which the whole animal may retire; head obtuse, eyes at the end of long, cylindrical, retractile peduncles; tentacles short, retractile; generative orifice on the side of the head, behind the right eye-peduncle; respiratory orifice in the collar, at the angle of the aperture of the shell, anal orifice immediately adjoining.

Shell discoidal, globose, or conoid, aperture transverse, oblique, lunate, or rounded, margins distinct.

Jaw arcuate, vertically ribbed, margins crenulated.

Lingual membrane broad, teeth numerous, centrals tricuspid, laterals bicuspid, uncini denticulated or serrated, centrals and laterals sometimes simply conical with an acute tip.

Helix alternata.

FIG. 114.

Shell orbicular, depressed, fawn colored, barred with oblique, zigzag lines of dusky; whorls five or six, with prominent wrinkles at the lines of growth; lip simple; umbilicus large and deep.

Helix alternata, SAY, Nich. Encyc. iv. pl. 1, fig. 2, 1817, 1818, 1819; Journ. Acad. ii. 161, 1821; BINNEY's ed. 6, 21, pl. 69, fig. 2. — EATON, Zool. Text Book, 193 (1826). — BINNEY, Bost. Journ. Nat. Hist. iii. 428, pl. 25 (1840); Terr. Moll. ii. 212, pl. 24. — GOULD, Inv. 177, fig. 114 (1841). — LEIDY, Terr. Moll. U. S. i. 253, pl. 7, figs. 2–5 (1851), anat. — DE KAY, N. Y. Moll. 29, pl. 2, fig. 9 (1843). — ADAMS, Vermont Moll. 162, figure (1842). — FÉRUSSAC, Tab. Syst. 44; Hist. pl. 79, figs. 8, 9, 10. — POTIEZ and MICHAUD, Galerie, 104. — CHEMNITZ, i. 2d ed. 181, t. 24, figs. 17, 18. — PFEIFFER, Mon. Hel. Viv. i. 102. — DESHAYES, in FÉR. Hist. i. 89. — REEVE, Con. Icon. 670 (1852). — BILLINGS, Canad. Nat. ii. 99, figs. 4, 5 (1857). — W. G. BINNEY, Terr. Moll. iv. 98. — BLAND, Ann. N. Y. Lyc. vii. — MORSE, Am. Nat. i. 187, figs. 17, 18 (1867).

Anguispira alternata, MORSE, Journ. Portl. Soc. i. 11, fig. 15; pl. 4, fig. 16 (1864). — TRYON, Am. Journ. Conch. ii. 261, pl. 4, fig. 47 (1866).

Helix scabra, LAMARCK, An. sans Vert. vi. part 2, 88. — DESHAYES, Encyc. Méth. ii. 219 (1830); in LAM. viii. 66; 3d ed. iii. 292. — CHENU, Ill. pl. 6, fig. 11.

Helix infecta, PARREYS MS. — PFEIFFER, Mal. Bl. 1857, 86; Mon. Hel. Viv. iv. 91, non REEVE.

Helix strongylodes, PFEIFFER, Proc. Zool. Soc. 1854, 53; Mon. Hel. Viv. iv. 91. — REEVE, Con. Icon. 1296 (1854). — *Vide* W. G. BINNEY, Terr. Moll. iv. pl. 77, fig. 8.

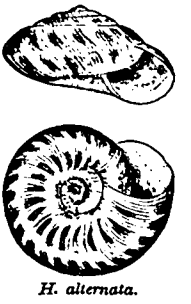
Helix mordax, SHUTTLEWORTH, Bern. Mitt. 1852, 195. — GOULD, in Terr. Moll. iii. 19. — W. G. BINNEY, Terr. Moll. iv. 99. — PFEIFFER, Mon. Hel. Viv. iii. 635. — BLAND, Ann. N. Y. Lyc. vii. (and var. *fergusoni*).

Helix dubia, SHEPPARD, Tr. Lit. Hist. Soc. Quebec, i. 194. — MCCULLOCH, (where?) teste BINNEY, Terr. Moll. i. 192.

Shell orbicular, depressed, slightly convex above and below; general tint a light fawn color, which, on the upper surface, alternates in about equal proportions, with oblique, zigzag bars of dark-brown; these bars grow narrower and lighter on the lower surface as they converge to the umbilicus; they are generally interrupted by a light colored zone which issues from the middle of the inner margin of the aperture; whorls five to six, flattened above, conspicuously plaited at the lines of growth so as to produce a rough surface

above, but nearly smooth beneath; the shell has a sharp dividing line between the upper and lower surfaces in all its earlier stages, which disappears only at maturity, forming a circular aperture, slightly modified by the preceding whorl; lip simple and delicate; umbilicus large and deep, exhibiting all the volutions. Greater diameter, twenty-one mill.; lesser, nineteen mill.; height, ten millimetres.

Fig. 673.



H. alternata.

Animal with the head and eye-peduncles of a light slate color, back brown, remainder of the upper surface brownish-orange; eyes black; base of foot drab colored; collar saffron. Eye-peduncle one third of an inch long, blackish at tip. Foot not much exceeding the diameter of the shell, terminating in a broad, flat, obtuse tip; a light marginal line runs along the foot from the head to the posterior tip.

Found everywhere in old forests and in moist situations under decaying logs and stumps. In this State it is not often found near the sea-coast. Dr. Yale, however, has observed numerous dead specimens on Martha's Vineyard. Also over the whole of Eastern North America as far north as Labrador. It occurs commonly in the post-pleiocene beds of the Mississippi Valley.

The shell varies in being more or less depressed, and the wrinkles more or less obvious; sometimes no bars are observable on the lower surface.

The animal and its eye-peduncles are proportionally shorter than in our other species. Its habits are gregarious, so that several are usually found in company.

Helix striatella.

Fig. 112.

Shell small, orbicular, depressed, rufous; whorls six, with prominent lines of growth; aperture declining, rounded; lip simple; base widely and deeply umbilicated.

Helix striatella, Anthony, Bost. Journ. Nat. Hist. iii. 278, pl. 3, fig. 2 (1840). — Binney, Bost. Journ. iii. 432, pl. 21, fig. 5 (1840); Terr. Moll. ii. 217, pl. 30, fig. 2. — Gould, Inv. 178, fig. 112 (1841). — Adams, Vermont Moll. 162 (1842). — De Kay, N. Y. Moll. 43, pl. 3, fig. 40 (1843). — Chemnitz, 2d ed. ii. 115, t. 85, figs. 36–38. — Pfeiffer, Mon. Hel. Viv. i. 104. — Reeve, Con. Icon. 727 (1853). — W. G. Binney, Terr. Moll. iv. 99. — Morse, Am. Nat. i. 545, fig. 40 (1867).

Helix ruderata, Adams, Sillim. Journ. [1] 40, 408, not Studer.

Helix Cronkheitei,* NEWCOMB, Proc. Cal. Ac. N. S. iii. 180 (1865).
Patula Cronkheitei, TRYON, Am. Journ. Conch. ii. 263 (1866).
Patula striatella, MORSE, Journ. Portl. Soc. i. 21, fig. 48; pl. 2, fig. 6; pl. 8, fig. 49 (1864).
Anguispira striatella, TRYON, Am. Journ. Conch. ii. 262, pl. 4, fig. 51 (1866).

Shell small, orbicular, very much depressed, almost discoidal, of a uniform reddish horn color; whorls four, flattened above and rounded below, separated by a well-defined suture, delicately wrinkled by the elevated and sharp lines of growth, and in all immature stages presenting a sharpened or carinated edge at the circumference; aperture rounded, declining, somewhat broader than high; lip simple and thin; lower surface rendered cup-shaped by a broad and deep umbilicus, whose diameter is nearly that of the outer volution. Diameter about one fourth of an inch.

Fig. 674.

H. striatella.

The animal has the tentacula bluish-black; margin and posterior part of foot white. Foot transparent, less than twice the diameter of the shell in length; terminating acutely.

This is a northern species, being found through British America, at Great Slave Lake, &c., Canada, and New England, and extends to Virginia and Kansas. Also on the Pacific side of the Rocky Mountains, near Hell Gate River. Found abundantly in all parts of this State, about old stumps, and under the bark of decaying logs.

The cup-shaped base, and beautifully raised lines of growth, sufficiently designate this shell. Its form is like that of *H. rotundata* of Europe, which, however, is checkered by darker bars, like our *H. alternata*.

This is the shell, which, till recently, has been regarded as the *H. perspectiva* of Say. Several gentlemen in Ohio, where both species are found, have for some years discriminated the two shells; and in January, 1839, Mr. J. G. Anthony communicated to the Boston Society of Natural History a description of this species. After mature examination, conchologists have become satisfied that the Massachusetts shell is the *H. striatella*, and that *H. perspectiva* is not found in this region. The differences are, that *H. striatella* is altogether a more delicate shell in structure and marking, the number of whorls is one less, the color is lighter and the shell smaller; the sharp external edge is also more conspicuous, and, looking into

* My opinion of this species is formed from the description alone. I have seen no authentic example. — W. G. B.

the throat, we do not find the tooth-like thickening which exists within the lower margin of *H. perspectiva*. Mr. Anthony also observes, that it is found in low lands, near running streams, and never about rotten logs, the common residence of *H. perspectiva*. This, however, does not accord with its habits in Massachusetts.

Helix asteriscus.

Shell umbilicated, depressed, with thin prominent ribs; whorls four; aperture sub-circular; peristome simple, acute.

Helix asteriscus, Morse, Proc. Bost. Soc. vi. 128 (1857). — W. G. Binney, Terr. Moll. iv. 103, pl. 77, fig. 9. — Bland, Ann. N. Y. Lyc. viii. 163, fig. 8. — Morse, Amer. Nat. i. 546, fig. 43 (1867).

Planogyra asteriscus, Morse, Journ. Portl. Soc. i. 24, figs. 50–52; pl. 2, fig. 5; pl. 8, fig. 53 (1864). — Tryon, Am. Journ. Conch. ii. 263, pl. 4, fig. 55 (1866).

Fig. 675.

H asteriscus Enlarged

Shell widely umbilicated, orbicularly depressed, light brown, decussated by delicate incremental and revolving striæ, and with from twenty-five to thirty delicate, thin, transparent, prominent ribs, with waving edges, and inclined backwards, more like the epidermis than the texture of the shell; whorls four, the upper ones flattened, the last globose; suture deeply impressed; aperture sub-circular; peristome simple, acute, its columellar extremity sub-reflected. Greater diameter, one and a half mill.; height, one half millimetre.

The animal is described by Morse as bluish-white, with head, neck, and eye-peduncles mottled by streaks and dots.

From Gaspé to the North of Lake Superior, and through New England.

Helix labyrinthica.

Fig. 106.

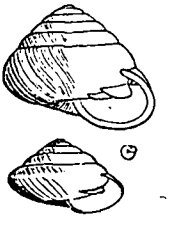
Shell minute, conic-globose; whorls six, with conspicuous oblique lines; lip reflected; aperture with one or two teeth prolonged within it; umbilicus minute.

Helix labyrinthica, Say, Journ. Phila. Acad. i. 124 (1817); Nich. Encyc. iv. 3d ed. (1819); ed. Binney, 10. — Binney, Bost. Journ. Nat. Hist. iii. 393, pl. 26, fig. 1 (1837); Terr Moll. ii. 202, pl. 17, fig. 3. — Gould, Inv. 184, fig. 106 (1841). — Adams, Vermont Moll. 160 (1842). — Férussac, Tab Syst. 38; Hist. pl. 51, *β*, fig. 1. — Pfeiffer, Symbolæ, ii. 31; Mon. Hel. Viv. i. 416. — Chemnitz, 2d ed. i. 382, t. 66, figs. 17–20. — Reeve, Con. Icon. 728 (1852). — De Kay, N. Y. Moll. 39, pl. 3, fig. 31 (1843). — Deshayes, in Fér. i. 210. — W. G. Binney, Terr. Moll. iv. 95. — Morse, Amer. Nat. i. 545, figs. 41, 42 (1867).

Strobila labyrinthica, Morse, Journ. Portl. Soc. i. 26, figs. 64–67; pl. 2, figs. *a*, *b*; pl. 8, fig. 68 (1864). — Tryon, Am. Journ. Conch. ii. 259, pl. 4, fig. 44 (1866).

Shell small, rounded-conical, apex obtuse; spire elevated, whorls six, separated by a well-marked suture, with conspicuous, oblique lines or ridges at regular distances; epidermis dark brownish horn color; aperture small; outer lip thickened, and somewhat reflected, often rose colored; inner lip with a long, raised line or tooth, which appears to revolve within the shell parallel to the suture, and sometimes a second nearer to the base, less conspicuous, and terminating farther within the aperture; beneath flat, umbilical region impressed, and the umbilicus minute. Greatest diameter one tenth of an inch, height nearly as much.

Fig. 676.



H. labyrinthica.

Animal has the head slate colored above, the tentacula quite dark; foot white as printing-paper, linear; space between the four tentacula and neck lighter colored.

Found in various parts of this State, usually in the fissures of decaying wood, or under fragments of wood in moist places, or in beds of decaying leaves. It inhabits a wide range of territory, having been found as far distant as Missouri. It is not frequently found, however, on account of its minuteness, and its dusky color.

It inhabits all of Eastern North America.* Also occurs in the post-pleiocene of the Mississippi Valley.

It is readily distinguished from other species by the remarkable raised lines revolving within the aperture. Usually, but one of them exists; but when both are present their parallel position gives them a close resemblance to the track of a railroad. The oblique plaiting of the whorls is very conspicuous, and renders the exterior quite beautiful. The outer lip in fresh specimens has a rose colored tint. The shell varies considerably in the elevation of the spire, being sometimes much flattened, and again it has a pointed apex.

Mr. Morse has lately given the following description of the internal laminæ which characterize this species: —

The shell has been described as having one revolving tooth within the aperture, and sometimes a second one terminating farther within the aperture. I have always found this second one constant, and also

* Woodward (Man. 384) refers an extinct English Eocene *Helix* to this species. I have seen no specimens of it, but cannot believe it identical. Mr. Bland writes me that he has received from France a fossil shell under the name of *Helix labyrinthicula*, apparently identical with our species. — W. G. B.

a *third* one but slightly raised between these two. At the base of the shell and far within the aperture are two more revolving ribs, running about a third of one volution. These are plainly visible through the substance of the shell. A heavy columellar tooth or rib extends from a slight distance within the aperture, nearly one volution back. This columellar tooth thickens the substance of the shell in the umbilical region and causes a distinct fold without the shell. A most singular feature is revealed in the structure of the parietal laminæ. With an ordinary magnifying power small swellings are seën at close intervals along these laminæ, which when magnified four hundred diameters are seen to be surmounted with from five to ten sharp spines pointing toward the aperture; these swellings appear to coincide in number and position with the raised ribs without the shell, though they are not formed at the same time; for as these laminæ approach the aperture they become attenuated and disappear. The surface upon which these laminæ rest is granulated, and not smooth as is generally the case with the interior of shells. It is difficult to imagine the use of these spiny projections, unless they may act in some way as points of resistance to the animal for the support of a very heavy shell.

Helix hirsuta.

FIG. 116.

Shell globular, hairy, chestnut colored; aperture very narrow; outer lip reflexed, having a fissure on its inner margin; pillar lip with a long compressed tooth; umbilicus closed.

Helix hirsuta, SAY, Journ. Phila. Acad. i. 17 (1817); ii. 161; ed. BINNEY, 8. — BINNEY, Bost. Journ. Nat. Hist. iii. 365, pl. 10, fig. 3 (1840); Terr. Moll. ii. 150, pl. 42, fig. 3, excl. *stenotrema*. — DE KAY, N. Y. Moll. 36, pl. 3, fig. 27. — GOULD, Inv. 175, fig. 116 (1841). — FÉRUSSAC, Tab. Syst. 38; Hist. pl. 50*a*, fig. 1. — DESHAYES, in LAMARCK, viii. 113; 3d ed. iii. 308; Encyc. Méth. ii. 253 (1830); in FÉR. i. 140. — MRS. GRAY, Fig. of Moll. An. pl. 193, fig 8, ex Bost. Journ. — PFEIFFER, Mon. Hel. Viv. excl. var. *β* i. 421; in CHEMNITZ, 2d ed. excl. var. i. 374 (1846); pl. 65, figs. 9–11 (1849). — REEVE, Con. Icon. No. 714 (1852). — LEIDY, Terr. Moll. U. S. i. 257, pl. 11, figs. 5, 6 (1851), anat. — W. G. BINNEY, Terr. Moll. iv. 62. — BLAND, Ann. Lyc. N. Y. vii. 327. — MORSE, Am. Nat. i. 151, figs. 14, 15 (1867).

Helix sinuata, GMÉLIN (teste PFEIFFER).

Helix isognomostoma, GMÉLIN (teste PFEIFFER).

Tridopsis hirsuta, WOODWARD, Man. pl. 12, fig. 7, no descr.

Helix fraterna, WOOD, Index, Suppl. 21, viii. fig. 16 (1828); ed. HANLEY, 226, fig. 16.

Helix porcina, SAY, Long's Exped. (1824) ii. 257, pl. 15, fig. 2 (young); BINNEY's ed. 30, pl. 74, fig. 2. — DE KAY, N. Y. Moll. 45 (1843). — PFEIFFER, Mon. Hel. Viv. iii. 97. — BLAND, Ann. Lyc. N. Y. vi. 344, with figure (1858).

Shell nearly globular; whorls five, rounded; suture distinct; epidermis brownish, covered with numerous sharp, rigid hairs; aperture very narrow, almost closed by an elongated, lamelliform tooth, situated on the pillar lip, and extending from the centre of the base nearly to the junction of the lip with the outer whorl; lip narrow, very much depressed and reflected against the body whorl, with a deep cleft or fissure near the centre of the inner margin; base convex; umbilicus wholly closed. Greatest diameter, one third of an inch; ordinary size less than one fourth of an inch diameter.

Fig. 677.

H. hirsuta.

Animal whitish, head and tentacula slate colored; foot slender, semi-transparent, length less than twice the breadth of the shell; cavity of the tentacula apparent when they are drawn in, by two dark lines, with a whiter space between.

Found from New England to Kansas and Virginia. Also in the post-pleiocene beds of the Mississippi Valley. Nova Scotia (*Willis*).

This very peculiar snail is at once distinguished from every other New England species by the singular fissure on the inner edge of the lip. There is sometimes a minute, tooth-like process on the inner and upper part of the lip, which is visible only on looking into the aperture. Sometimes its hairy vesture covers it at every part; at other times it is quite smooth. Dr. Binney has once or twice noticed a white band on the body whorl.

Helix monodon.

FIG. 113.

Shell rather depressed, dusky horn color, hispid; aperture semi-lunar; lip white, reflexed; with a single elongated tooth fixed obliquely to the pillar; umbilical region excavated.

Helix monodon, RACKETT, Lin. Trans. xiii 42, pl. 5, fig. 2 (1822); ed. CHENU, 269, pl. 27, fig. 5. — WOOD, Index, Suppl. pl. 7, fig. 15 (1828); ed. HANLEY, 226, fig. 15. — BINNEY, Bost. Journ. Nat. Hist. iii. 360, pl. 10, fig. 1 (1840); Terr. Moll. ii. 147, pl. 41, lower figures. — GOULD, Inv. 174, fig. 113 (1841). — ADAMS, Vermont Moll. 159 (1842). — W. G. BINNEY, Terr. Moll. iv. 60. — DE KAY, N Y. Moll. 35, part, excl. syn., pl. 3, fig. 19; not fig. 21, *a*, *b* (1843). — MRS. GRAY, Fig. Moll. An. pl. 193, fig. 11, ex Bost. Journ. no descr. — BILLINGS, Canadian Nat. ii. 100, fig. 6 (1857). — PFEIFFER, Mon. Hel. Viv. iv. 320. — MORSE, Am. Nat. i. 151, figs. 12, 13 (1867).

Helix convexa, CHEMNITZ, part (excl. syn. et tab. 66, figs. 24, 27), pl. 10, figs. 17, 18. — PFEIFFER, Mon. Hel. Viv. iii. 268 (excl. β et γ). — DESHAYES, in LAM. viii. 112; Encyc. Méth. ii. 253 (1830); 3d ed. iii. 308; in FÉR. l. c. i. 144. — REEVE, Con. Icon. No. 696 (1852), excl. syn.; No. 717 (1854).

Helicodonta hirsuta, FÉRUSSAC, Tabl. Syst. 101, no descr.

Stenotrema monodon, MORSE, Journ. Portl. Soc. i. 10, fig. 13; pl. 2, fig. 2; pl. 4, fig. 14 (1864). — TRYON, Am. Journ. Conch. iii. 56, pl. 9, figs. 18–20 (1867).

VAR. FRATERNA.

Helix fraterna, SAY, Long's Exped. ii. 257, pl. 15, fig. 3; BINNEY's ed. 30, pl. 74, fig. 3. — MRS. GRAY, Fig. Moll. An. pl. 193, fig. 5, no descr. — BINNEY, Bost. Journ. iii. 363, pl. 10, fig. 2, not of WOOD.

Helix monodon, DE KAY, l. c. part, pl. 3. fig. 21, *a*, *b* (1843). — WOOD, Index, Suppl. pl. 7, fig. 15.

Helix convexa, CHEMNITZ, ed. 2, i. 86, part; — var. REEVE, Con. Icon. l. c. — *β*; PFEIFFER, Mon. Hel. Viv. i. 420.

Helix monodon β, PFEIFFER, l. c. iv. 320.

VAR. LEAII.

Helix convexa γ, PFEIFFER, l. c.; var. CHEMNITZ, l. c. pl. 66, figs. 24, 25.

Helix monodon γ, PFEIFFER, Mon. Hel. Viv. iv. 320. — part BINNEY, Terr. Moll. pl. 41, central figures.

Helix Leaii, WARD, MS. teste BINNEY.

LISTER, Syn. Conch. pl. 93, fig. 94.

Shell slightly convex; whorls five or six, narrow, diminishing very gradually in breadth from the outer whorl to the apex, marked with very fine lines of growth, and covered with a dark russet or chestnut colored epidermis, which is beset with very minute, hair-like projections; aperture contracted by a deep groove behind the lip; lip white, narrow, reflexed, a little grooved on its face, extending on the base to the umbilicus and slightly contracting it, and its outer edge not projecting beyond the surface of the whorl; umbilicus deep, not exhibiting all the volutions, partially covered by the lip; base rounded, very much excavated at the umbilical region, with a compressed, elongated white tooth at the edge of the aperture. Greatest diameter nearly half an inch.

Fig. 678.

H. monodon.

Animal yellowish-brown, darker on the head and tentacula. Foot narrow, cylindrical, half as long again as the diameter of the shell, terminating in a point. Eyes black.

Found in the middle and western parts of this State, sometimes in forests with other species, but more commonly on the hill-side pastures under stones, where other species rarely occur. Two individuals are commonly found together. It is also found in the Northern and Northwestern States; indeed, through all of Eastern North America, and through Canada. Also in the post-pleiocene of the Mississippi Valley.

The varieties of this shell present remarkable differences in size, coloring, and in the form of the umbilicus. The transverse diam-

eter varies from one sixth to three sixths of an inch, and the form from sub-globular in small specimens to a very flattened shape in the larger. The coloring exhibits every shade, from light amber to dark chestnut. The whorls of some revolve about the axis at such a distance as to leave a deep and wide umbilicus (*monodon*); while in others they are in such near approximation as to permit only a small perforation, which the narrow, reflected peristome is sufficiently wide to cover (*fraterna*). The hairy projections of the epidermis are most distinct upon the young shells, but are often wanting at every stage of growth. The oblique striæ are so fine as hardly to be visible; and in some instances the shell appears to be glabrous. Very beautiful specimens, about one fourth of an inch in diameter, with a dark, shining epidermis and open umbilicus, occur in Ohio, Indiana, Iowa, and Michigan. They are more convex, and, as the same number of volutions is contained in half the space, they *appear* to have more whorls than the common variety. Some persons have considered these to form a distinct species (*H. Leaii*, Ward, MS.); but I do not see that they can, with propriety, be separated.

Helix palliata.

Shell depressed, thin, hairy; aperture three-lobed, contracted, two teeth on inner margin of peristome, and curved tooth on parietal wall; whorls five; peristome reflected; umbilicus closed.

Helix palliata, Say, Journ. Phila. Acad. ii. 152 (1821); Binney's ed. 10. — Binney, Bost. Journ. Nat. Hist. iii. 353, pl. 7 (1840); Terr. Moll. ii. 136, part, pl. 14. — Adams, Vermont Moll. 159 (1842). — Leidy, Terr. Moll. U. S. i. 253, pl. 7, fig. 8, anat. (1851). — De Kay, N. Y. Moll. 33, pl. 3, fig. 36 (excl. *a*, *b*) (1843), excl. syn. part. — Pfeiffer, Mon. Hel. Viv. i. 316; in Chemnitz, 2d ed. i. 359, pl. 62, figs. 15, 16 (1849). — Mrs. Gray, Fig. Moll. An. pl. 193, fig. 8, ex Bost. Journ. (no descr.). — Deshayes, in Fér. i. 144 (excl. var.). — Reeve, Con. Icon. No. 678. — W. G. Binney, Terr. Moll. iv. 56. — Bland, Ann. Lyc. N. Y. vii. 441. — Morse, Am. Nat. i. 150, figs. 10, 11 (1867).

Helix denotata, Férussac, Tab. Syst. 38 (1822), no descr.; Hist. pl. 11 *a*, fig. 5; pl. 50 *a*, fig. 7. — Deshayes, in Lamarck, viii. 115; 3d ed. iii. 309.

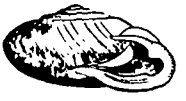
Helix notata, Deshayes, Encyc. Méth. ii. 224 (1830).

Xolotrema palliata, Tryon, Am. Journ. Conch. iii. 49, pl. 9, fig. 4 (1867).

Shell with the umbilicus closed, thin, depressed; epidermis dark brown or chestnut color, and rough with minute, acute projections and stiff hairs; whorls five, flattened above and rounded below, with numerous very fine, oblique striæ; aperture three-lobed, much contracted by the peristome and teeth; peristome white, sometimes

edged with brown, widely reflected, with two projecting teeth on the inner margin, the one near its junction with the body whorl acute and prominent, the other on the basal portion, long, lamellar, and but little prominent; parietal wall with a very prominent, white, curved tooth, projecting nearly perpendicularly from the shell, and forming one boundary of the aperture; umbilicus covered with a white callus, the continuation of the reflected peristome; base convex. Greater diameter twenty-one, lesser, eighteen, height ten millimetres.

Fig. 679.



H. palliata.

From Canada to Georgia, through Eastern North America. Also in the post-pleiocene of the Mississippi Valley.

Animal of a uniform, blackish, slate color over the whole surface; foot narrow, in length double the diameter of the shell, and terminating in an acute point; eye-peduncles one third of an inch long; eyes not distinguishable from the general color.

The nature of the epidermis and sculpturing are the only constant specific characters which distinguish *H. palliata* from *H. obstricta*. In the former the epidermis has "numerous minute tuberculous acute prominences"; the striæ are close together, and somewhat irregular in development. In the typical form the whorls are convex, with a well-impressed suture; the last whorl is obtusely angulated in front of, but not behind the aperture.

The species varies, in the form of the whorls and extent of the angulation of the periphery, as follows: —

Var. β. — Whorls flattened above, slightly exserted, the last more sharply angulated in front of the aperture, with the striæ, especially behind the aperture, more distinctly defined. Greater diameter twenty-two, lesser nineteen and a half, height eight and a half millimetres (five whorls). Kentucky and Tennessee.

Var. γ. — Whorls planulate above, and so exserted as to show the carinated edges of all excepting the apical whorls, the last whorl with an acute projecting carina continued to the back of the aperture; the umbilicus not always entirely covered by the reflected lip. Greater diameter twenty-one and a half, lesser eighteen and a half, height seven millimetres (five whorls). Tennessee.

Helix tridentata.

FIG. 115.

Shell depressed, yellowish horn colored; whorls obliquely wrinkled; aperture contracted, three-lobed, two teeth on the outer lip, and a curved one on the pillar; lip reflexed, white; umbilicus deep.

Helix tridentata, SAY, Nich. Encyc. pl. 2, fig. 1 (1817, 1818, 1819); BINNEY's ed. 6, pl. 70, fig. 1. — EATON, Zool. T. B. 193 (1826). — FÉRUSSAC, Tab. Syst. 38; Hist pl. 1, fig. 3. — WOOD, Index, Suppl. 21, pl. 7, fig. 2 (1828); ed. HANLEY, 226, fig. 11. — DESHAYES, Encyc. Méth. ii. 213 (1830); in LAMARCK, viii. 115; 3d ed. 309; in FÉR. l. c. i. 72. — BINNEY, Bost. Journ. Nat. Hist. iii. 382, pl. 17 (1840), part; in Terr. Moll. ii. 183, pl. 27. — ADAMS, Vermont Moll, 160 (1842). — GOULD, Inv. 173, fig. 115 (1841). — PFEIFFER, Mon. Hel. Viv. i. 412; in CHEMNITZ, 2d ed. i. 84, pl. 10, figs. 7, 8. — POTIEZ et MICHAUD, Gal. i. 114. — MRS. GRAY, Fig. Moll. An. pl. 291, fig. 3 (ex Bost. Journ. no descr.). — REEVE, Con. Icon. No. 690 (1852). — W. G. BINNEY, Terr. Moll. iv. 70. — BLAND, Ann. N. Y. Lyc. vii. 423. — MORSE, Am. Nat. i. 150, figs. 8, 9 (1867).

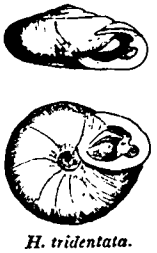
Triodopsis lunula, RAFINESQUE, En. and Acc. 3; ed. BINNEY and TRYON, 68.

Triodopsis tridentata, TRYON, Am. Journ. Conch. iii. 50, pl. 9, figs. 6, 13 (1867).

LISTER, pl. 92, fig. 92.

Shell flattened, slightly convex above and below, yellowish horn colored; whorls four and a half to six, slightly convex, crossed obliquely with numerous fine and regular lines of growth; aperture contracted, rendered trilobate by the presence of two small, pointed teeth on the outer lip; opposite the middle lobe, placed obliquely on the inner lip, is a thin, somewhat curved, white tooth; lip broad, white, partially reflected, with a constriction behind it; umbilicus not large, deep, and partly covered by the extremity of the reflected lip. Diameter about half an inch.

Fig. 680.



H. tridentata.

Animal dark bluish-slate color, deeper on the head, back, and tentacula; foot nearly twice as long as the diameter of the shell.

This well-marked species is not found near the sea-coast, and but rarely in the forests, at the western part of this State. From Canada through all Eastern North America.

It varies much in size and other respects, in different localities. Specimens from this region have the lip narrow, the teeth small, the aperture but slightly contracted, the spire depressed, and are of a medium size. In Ohio it is larger, in Florida much smaller.

Dr. Binney regards the *H. fallax* of Say as a variety of this species, in which the spire is more elevated, and the parts about the

aperture greatly developed, so that the aperture is nearly closed by the teeth and the stricture behind the lip; the upper lip-tooth has often two or three points, and the tooth on the inner lip extends quite to the base of the shell, so as to unite with the extremity of the lip.

The middle one of the three lobes is smallest, and their outline regularly arched, so as to resemble somewhat the ace of clubs.

Helix albolabris.

FIG. 101.

Shell orbicular-conical, yellowish horn color; whorls five or six, convex, marked with the lines of growth, and minute revolving lines; lip white, broadly reflected; umbilicus closed.

Helix albolabris, SAY, Nich. Encyc. pl. 1, fig. 1 (1817, 1818, 1819); J. A. N. S. ii. 161 (1823); Amer. Conch. No. 2, pl. 13 (1831); BINNEY'S ed. 21, pl. 69, fig. 1. — CHENU, Bibl. Conch. 3, 21, pl. 3, fig. 3*a*. — EATON, Zool. Text Book, 193 (1826). — ADAMS, in Thompson's Vermont, i. 158, with woodcut. — FÉRUSSAC, Tab. Syst. 36; Hist. pl. 43, figs. 1, 2, 3. — BINNEY, Bost. Journ. Nat. Hist. i. 475, pl. 13 (1837); Terr. Moll. ii. 99, pl. 2. — DE KAY, N. Y. Moll. 26, pl. 2, fig. 12 (1843). — GOULD, Inv. 170, fig. 101 (1841). — LEIDY, Terr. Moll. U. S. i. 252, pl. 6, anat. (1851). — PFEIFFER, Symb. ii. 22, excl. γ and δ; Mon. Hel. Viv. i. 290, excl. β and γ; in CHEMNITZ, 2d ed. i. 81, pl. 15, figs. 7, 8 (1847), excl. var. C. and D. pl. 10, figs. 4, 5. — POTIEZ et MICHAUD, Gal. i. 69. — REEVE, Con. Icon. No. 624. — DESHAYES, in FÉR. i. 137, pl. 43, figs. 1, 2, 3, 5. — BILLINGS, Canadian Nat. and Geol. ii. 98, figs. 2. 3. — BLAND, Ann. N. Y. Lyc. vi. 358 (1858). — W. G. BINNEY, Terr. Moll, iv. 43. — MORSE, Am. Nat. i. 6, pl. 1, figs. 1–11; p. 96, fig. 2 (1867).

Helix rufa, DE KAY? N. Y. Moll. 44, pl. 3, fig. 30 (1843).

Mesodon albolabris, MORSE, Journ. Portl Soc. i. 8, fig. 7; pl. 3, fig. 8 (1864). — TRYON, Am. Journ. Conch. iii. 39, 44, pl. 7, figs. 5–7 (1867).

Shell orbicular, depressed-conical, thin, shining, of a yellowish-brown or russet-color; whorls five to six, rounded, separated by a well-defined suture, and forming a moderately elevated spire, regularly and distinctly wrinkled by the lines of growth which are crossed by very numerous, delicate, revolving hair lines, scarcely visible without a magnifier; aperture semi-elliptical, contracted by the lip, which is white, and very broadly reflected; outer edge sharp, somewhat waved, and colored orange on the back; umbilicus covered by the extremity of the lip. Diameter generally over one inch.

Fig. 681.

H. albolabris.

The animal varies in color, sometimes being pure white, cream-color, or grayish; head brownish above; tentacula dusky at tip;

eyes black; back shagreened with glandular tubercles; foot rather more than twice the diameter of the shell, pointed behind.

Found in large numbers in all the partially cleared forests of New England, sheltered in the moist mould under decaying logs and rotten stumps; and sometimes about stone-walls and rocks in the open fields. It is found in all the States, from Canada to Arkansas, Georgia to Minnesota. Also in the post-pleiocene of the Mississippi Valley.

This is our largest snail, and, though so simple in its structure and coloring, is a pleasing shell. Its delicately striated surface, and broad, white lip, cannot fail to gain admiration. It is subject to very little variety, the principal variations being its want of the white reflected lip, and an open umbilicus in its immature stages. It has no tooth on the pillar, like *H. thyroides* and *H. exoleta*, is smaller than the former and less globular than the latter.

The economy of these animals may be briefly stated as follows. They subsist upon decaying leaves and vegetable fibre, under which they usually shelter themselves. In moist weather, and after showers, they issue from their retreats, and crawl over the leaves or up the trunks of trees, until driven back by a change of weather. In early spring they are often seen collected in groups on the sunny side of rocks. In June they deposit their eggs, to the number of thirty to eighty, in the light mould by the side of rocks and logs. These are white, opaque, and elastic; and in about twenty to thirty days the young animal issues from them with a shell consisting of one whorl and a half. In October they cease to feed, and select a place under some log or stone where they may be sheltered for the winter, and there they fix themselves, with the mouth upwards. This they close by secreting a thin, transparent membrane, and as the weather becomes cold they grow torpid, and remain in that state until the warmth of spring excites them to break down the barrier, and enter upon a new campaign of duty and pleasure.

Helix dentifera.

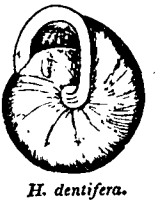
Shell convex, yellowish horn color; whorls five; aperture contracted; peristome white, broadly reflected; parietal wall with a single white tooth; imperforate.

Helix dentifera, Binney, Bost. Journ. Nat. Hist. i. 494, pl. 21 (1840); Terr. Moll. ii. 134, pl. 12. — Adams, Mollusca, &c. 159 (1842). — Pfeiffer, Mon. Hel. Viv. i. 317. — W. G. Binney, Terr. Moll. iv. 55. — De Kay, N. Y. Moll. 34, pl. 2, fig. 17 (1843).

— Mrs. Gray, Fig. of Moll. An. pl. 191, fig. 11, no descr. from Bost. Journ. — Morse, Am. Nat. i. 99, figs. 6, 7 (1867). — Not of Pfeiffer, Mon. Hel. Viv iii. and iv.; not of Chemnitz, ed. 2 (*roemeri*).

Shell imperforate, flattened, convex on the upper surface, convex below; epidermis yellowish horn color, immaculate; spire depressed; whorls five, with delicate, parallel oblique striæ; suture distinct, not deeply impressed; aperture contracted by the peristome, flattened towards the plane of the base; peristome thickened, white, broadly and abruptly reflected; parietal wall with a prominent, white, tooth-like process nearly parallel with the lower margin of the aperture, not projecting towards the umbilicus; base convex. Greater diameter twenty-three, lesser eighteen, height ten millimetres.

Fig. 682.



H. dentifera.

From Maine to Virginia and to Ohio. It prefers mountainous country.

Readily distinguished from the allied species by the very angular and broad reflection of the peristome.

Helix thyroides.

Fig. 108.

Shell convex, yellowish horn color; whorls five, delicately wrinkled; aperture rounded; lip white, widely reflected; pillar with a single white tooth; umbilicus partial.

Helix thyroidus, Say, Nich. Encyc. (Amer. ed.) 1817, 1818, 1819; Journ. Acad. i. 123 (1817); Amer. Conch. (1831) No. 2, pl. 13; ed. Binney, 33, pl. 13; ed. Chenu, Bibl. 3, 22, pl. 3, fig. 3. — Eaton, Zool. T. B. 193 (1826). — Férussac, Hist. pl. 49 *a*, fig. 4; pl. 50 *a*, fig. 6 ? — Deshayes, Encyc. Méth. ii. 230 (1830); in Lamarck, An. sans Vert. viii. 114; 3d ed. iii. 309; in Fér. i. 209. — Binney, Bost. Journ. Nat. Hist. i. 488, pl. 18 (1837); Terr. Moll. ii. 129, pl. 11. — Leidy, Terr. Moll. U. S. i. 257, pl. 11, fig. 7–9 (1851) anat. — De Kay, N. Y. Moll. 29, pl. 2, fig. 8. — Gould, Inv. 171, fig. 108 (1841). — Adams, Vermont Moll. 159 (1842). — Mrs. Gray, Fig. Moll. An. pl. 291, fig. 6, from Bost. Journ., no descr.

Helix thyroides, Pfeiffer, Mon. Hel. Viv. i. 345; in Chemnitz, 2d ed. i. 331, pl. 58, figs. 8, 9 (1850). — Reeve, Con. Icon. No. 677. — W. G. Binney, Ter. Moll. iv. 53. — Morse, Am. Nat. i. 98, fig. 3 (1867).

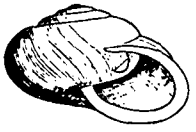
Anchistoma thyroides, H. and A. Adams, Gen. pl. 78, fig. 3, no descr.

Mesodon thyroides, Tryon, Am. Journ. Conch. iii. 41, pl. 8, fig. 1 (1867).

Shell rounded, convex, of a uniform yellowish-brown or russet color; whorls about five, convex, marked with delicate and parallel lines of growth; suture distinct; aperture broad, semi-lunar, con-

tracted by the lip; lip white, widely reflected, and sometimes grooved, its exterior yellowish; at the inner side, on the last whorl, is a white, tooth-like tubercle, placed obliquely; umbilicus exhibiting only one volution, and partially covered by the reflected lip. Diameter about three fourths of an inch.

Fig. 683.



H. thyroides.

Animal of a dirty yellowish color, with a grayish hue in some individuals; tentacula darker; eyes black; base of the foot dirty white; length equal to twice the diameter of the shell.

Found in nearly all parts of this State, but by no means common. It is numerous from Canada through all Eastern North America, and in the post-pleiocene of the Mississippi Valley.

This is a plain but pretty shell, bearing a great resemblance to *H. albolabris*, yet readily distinguished from it. It is a smaller shell, more globose; its aperture is more oblique, and the partially closed umbilicus and tooth on the inner lip are specially characteristic. It varies considerably in its size, and in the degree of its convexity. The umbilicus is sometimes entirely closed; and in immature shells the tooth is generally wanting. It is occasionally found reversed.

Helix Sayii.*

Shell depressed, light russet; whorls between five and six; aperture lunately sub-circular; peristome white, reflected, with tooth on inner edge; white tooth on parietal wall; umbilicus open.

Helix diodonta, Say, Long's Exped. (1824) ii 257, pl. 15, fig. 4; ed. Binney, 39, pl. 74, fig. 4. — De Kay, N. Y. Moll. 34, pl. 2, fig. 18. — Deshayes, in Férussac, pl. 69, i. fig. 2.

Helix Sayi, Binney, Bost. Journ. Nat. Hist. iii. 379, pl. 16 (1840); Terr. Moll. ii. 180, pl. 23. — Adams, Vermont Moll. 160 (1842). — W. G. Binney, Terr. Moll. iv. 70. — Leidy, Terr. Moll. U. S. i. 256, pl. 11, figs. 1-4 (1851), anat. — Pfeiffer, Mon. Hel. Viv. i. 382; in Chemnitz, 2d ed. iii. 419, t. 148, figs 13, 14. — Mrs. Gray, Fig. Moll. An. pl. 193, fig. 10, from Bost. Journ., no descr. — Deshayes, in Fér. i. 79. — Reeve, Con. Icon. No. 679 (1852). — Morse, Am. Nat. i. 98, figs. 4, 5 (1867).

Mesodon Sayii, Morse, Journ. Portl. Soc. i. 9, fig. 9; pl. 4, fig. 10 (1864).

Ulostoma Sayii, Tryon, Am. Journ. Conch. iii. 38, pl. 7, fig. 4 (1867).

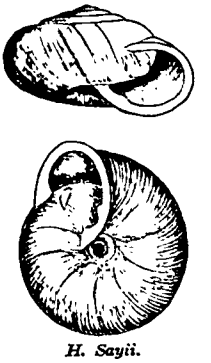
Shell umbilicated, orbicularly-depressed, thin; epidermis light russet, shining; whorls between five and six, with numerous fine,

* The name *H. Sayii* is preoccupied, but Wood gives no description, and even if he did I should not reject the well-established use of the name for this species. — W. G. B.

oblique striæ; suture impressed; aperture lunately sub-circular, not dilated; peristome white, narrow, thickened, reflected, with a slightly projecting tooth on the inner edge of the basal portion near the umbilicus; parietal wall with a sub-prominent, white tooth; umbilicus open, deep, not wide, exhibiting all the volutions, slightly contracted by the reflected peristome; base rounded with the striæ distinct, converging into the umbilicus. Greater diameter twenty-seven, lesser twenty-three, height seventeen millimetres.

From Canada East to Michigan and Maryland.

Fig. 684.



H. Sayii.

" Helix? harpa.

Shell ovately-conic, light horn color; whorls four, convex; aperture lunately oval; peristome simple; sub-perforate.

Helix? harpa, Say, Long's Exped. ii. 256, pl. 15, fig. 1 (1824); Binney's ed. 29, pl. 74, fig. 1.

Pupa costulata, Mighels, Proc. Bost. Soc. Nat. Hist. i. 187 (1844).

Bulimus harpa, Pfeiffer, Zeitschr. für Malak. 1847, 147; Mon. Hel Viv. ii. 150; in Chemnitz, 2d ed. No. 305, pl. 60, figs. 17–19. — Reeve, Con. Icon. No. 596 (1849). — Binney, Terr. Moll. ii. 290, pl. 52, fig. 3. — W. G. Binney, Terr. Moll. iv. 135.

Zoogenites harpa, Morse, Journ. Portl. Soc. i. 32, pl. 1, figs. 1–14 (1864); Am. Nat. i. 608, figs. 50, 51 (1868).

Shell sub-perforate, ovately conic, transparent, very thin, with coarse, irregular lines of growth, pellucid, light horn color; spire conical, rather obtuse; whorls four, convex, the upper ones smooth, the last two with prominent, distant, thin, colorless, fold-like ribs, slightly inclined backwards, the last whorl rounded, somewhat longer than the spire; columella sub-receding; aperture lunately oval; peristome simple, straight, the columellar termination briefly reflected above. Greater diameter, two mill.; length, three and a half mill.; aperture one and two thirds long, one and one fourth millimetres wide.

Fig. 685.

H.? harpa. Enlarged.

Gaspé, Maine, New Hampshire. Originally found by Say on the Expedition to St. Peter's River, &c. Also in British America and Sweden (Mal. Blat. 1867, p. 200).

Animal small compared to the size of the shell, body and head slate color, eye-peduncles darker, short, thick, bulbous; eyes large,

distinct; foot but two thirds length of shell, whitish; the body, disk, and mantle are marked with white dots, the edge of the mantle is of the same color as the head and eye-peduncles. The disk is rounded posteriorly, and broad and truncated anteriorly, the lateral borders are deeply crenulated. The head is separate from the disk as in the *Pupinæ*, bearing two minutely crenulated lappets, which hang down on either side of the mouth like a visor, reminding one of the oblique folds on the head of *Glandina truncata*, which we believe to be homologous to them. A longitudinal furrow extends from the mouth downward. The body is so translucent that when extended the ganglionic centres can be plainly seen. In motion they are exceedingly graceful, at times poising their beautiful shell high above their body, and twirling it around not unlike the *Physa*, again hugging their pretty harp close to their body, the shell when in this last position continually oscillates as if the animal could not balance it; it rarely ever moves in a straight line, but is always turning and whisking about, and this is done at times very quickly and abruptly. (*Morse.*)

Fig. 686.

Animal of *H.? harpa.* Enlarged.

Helix pulchella.

Fig. 102.

Shell minute, white, depressed; whorls four, suture deep; aperture circular, lip reflexed, thickened; umbilicus large.

Helix pulchella, Müller, Verm. 30. — Pfeiffer, Mon. Hel. Viv. i. 365. — Binney, Bost. Journ. Nat. Hist. iii. 375, pl. 9, fig. 2 (1840); Terr. Moll. ii. 175, pl. 17, fig. 1. — Leidy, Terr. Moll. U. S. i. 256, pl. 9, figs. 7–9 (1851) anat. — Gould, Inv. 176, fig. 102 (1841). — Adams, Vermont Moll. 159 (1842).

Helix minuta, Say, Journ. Acad. i. 123 (1817); Nich. Encyc. 3d ed. (1819); Binney's ed. 3. — De Kay, N. Y. Moll, 40, pl. 3, fig. 33 (1843).

Helix costata, Müller, *vide* Pfeiffer, Mon. Hel. Viv. i. 366.

Vallonia minuta, Morse, Journ. Portl. Soc. i. 21, figs. 54, 56; pl. 8, fig. 57 (1864). — Tryon, Am. Journ. Conch. iii. 36, pl. 7, fig. 26 (1867).

Shell minute, semi-transparent, white, or very light horn color, thin, depressed; whorls four, very minutely marked with lines of growth, the last spreading at the mouth like a trumpet; suture deeply impressed; aperture circular, the lip very nearly surrounding it, much thickened, white, and reflected; umbilicus large, exhibiting all the volutions within. Diameter one tenth of an inch.

Animal pale, semi-transparent.

Rather common in the vicinity of Boston, under stones in rich soil, and about decaying stumps. It is probably abundant in all parts of this State, and has been noticed from Canada East to Nebraska and Florida. Also throughout Europe, Siberia, Thibet, Madeira, Azores, &c.

Fig. 637.

H. pulchella. Enlarged.

This very minute snail is a very beautiful shell when examined by a magnifier. It has rather the external characters of *Cyclostoma* than of *Helix*. It agrees with the *H. pulchella* of Müller in all respects, except that it is never supplied with the sharp, parallel ribs which are frequently found on the foreign specimens, though by no means constantly. It is thought by some to have been introduced from Europe. But, as Dr. Binney remarks, "it does not seem possible that so small an animal, if naturalized since the arrival of Europeans, could have been able to penetrate to the remote points in the interior of the continent where it is now found."

Helix hortensis.

Shell sub-globose, thin, smooth, greenish-yellow, or variously banded with brown; lip reflexed, white, thickened within; umbilicus closed.

Helix hortensis, Müller, &c. — Pfeiffer, Mon. Hel. Viv. iii. 195. — Mrs. Sheppard, Tr. Lit. Hist. Soc. Quebec, i. 193 (1829). — Gould, Inv. 172. — Binney, Terr. Moll. ii. 111, pl. 8. — W. G. Binney, Terr. Moll. iv. 51. — Morse, Am. Nat. i. 186, fig. 16 (1867).

Helix sub-globosa, Binney (formerly), Bost. Journ. Nat. Hist. i. 485, pl. 16 (1837). — De Kay, N. Y. Moll. 33, pl. 2, fig. 14; pl 3, fig. 39.

Tachea hortensis, Tryon, Am. Journ. Conch. ii. 321, pl. 6, figs. 14, 15 (1866).

Shell sub-globular, thin, smooth, and shining; whorls four or five, convex, with apparent lines of growth; suture distinct; termination of the outer whorl declining; aperture rounded, slightly contracted at the base by the thickening and inflection of the lip; lip slightly reflected, white, thickened within; base somewhat convex, umbilicus covered; general color greenish-yellow, more or less dark; sometimes plain, but generally variously banded with dark reddish-brown. Diameter about three fourths of an inch.

Fig. 638.

H. hortensis.

The animal has the head and neck blackish, with a slight tinge of brown; tentacula smoky; eyes black; base of foot inky, tip dirty flesh-color; respiratory orifice

surrounded by a dark circle; length about twice the diameter of the shell.

Inhabits the sea-coast, and is common on the lower parts of Cape Cod and Cape Ann. It is very abundant on Salt Island, near Gloucester. An European species, introduced by commerce (?) to the Northeastern portion of North America. It is found on islands along the coast from Newfoundland to Cape Cod, and on the mainland plentifully, in Gaspé, C. E.; also along the St. Lawrence; Vermont (?), Connecticut (?), &c. It also inhabits Greenland.

This species, so abundant in Europe, and so well known in every cabinet, has been undoubtedly imported to this continent, and has not as yet made great advances into the interior. The specimens first discovered by Dr. Binney were all of the plain, greenish-yellow variety; and, though he could not fail to perceive their affinity to the *H. hortensis*, he thought he discovered differences enough to entitle them to a specific distinction, and therefore described them under the name *H. sub-globosa*. But numerous specimens have since been brought from the same vicinity, bearing all the various zones of the European specimens. His remarks on the manner in which the epiphragm, which closes up the orifice in winter, is formed, are curious. Unlike other American species, they are not found burrowing under stones and decayed leaves, but on the ground, and crawling up the stems of plants.

Fig. 689.

H. nemoralis.

The best authorities now regard the *H. hortensis* of authors as merely a variety of *H. nemoralis*, Lin., with a white instead of a dark lip.

The *Helix nemoralis* of Europe, distinguished readily from *H. hortensis* by its black peristome, but by many considered identical, does not appear to have been introduced from Europe into the New England States or British Provinces. In 1857 I imported some hundred specimens from near Sheffield, England, and freed them in my garden at Burlington, New Jersey. They have thriven well and increased with great rapidity, so that now (1869) the whole town is full of them. They retain the habit of the species of climbing hedges and trees, not remaining concealed under decaying leaves, logs, &c., like the American *Helices*. Fig. 689 is drawn from Burlington specimens. The experiment of introducing the *Helix nemoralis* is interesting, as showing the adaptability of the species to a new climate. Other species, among them *H. lapicida*

from England and *Stenogyra decollata* from Charleston, S. C., placed in my garden at the same time, disappeared at once.

Genus CIONELLA, Jeffreys. 1829.

Shell oblong-acuminate or ovate-oblong, striated or smooth, shining; whorls six to seven, the last rounded; aperture oval, equalling about one half to one third the shell's length, columella short, arcuate, more or less truncated, peristome straight, often thickened.

Jaw slightly arched, slender, furrowed with delicate, vertical striæ, its concave margin scarcely denticulated.

Lingual teeth arranged in transverse series, central tricuspid, laterals bicuspid, uncini serrated.

Cionella sub-cylindrica.

Fig. 124.

Shell small, oblong-ovate, obtuse, smooth and polished, transparent, brownish horn color; whorls six, rounded; aperture small, ovate; lip simple, thickened within.

Helix sub-cylindrica. Linnæus, Syst. ed. 12, ii. 1248 (1767), not Mont.
Helix lubrica, Müller, Verm. Hist. i. 104 (1774).
Bulimus lubricus, Draparnaud, Moll. 75, pl. 4, fig. 24. — Gould, Inv. 193, fig. 124 (1841). — Adams, Vermont Moll. 157 (1842). — De Kay, N. Y. Moll. 55, pl. 3, fig. 43 (1843). — Binney, Terr. Moll. ii. 283, pl. 42, fig. 4.
Achatina lubrica, Pfeiffer, Mon. Hel. Viv. ii 272. — W. G. Binney, Terr. Moll. iv. 138.
Zua lubrica, Gray, Man. 188. — Leach, Moll. 114. — Reeve, Brit. L. and F. W. Shells, 93 (1863).
Cionella lubrica, Jeffreys, Lin. Trans. xvi. 327.
Bulimus lubricoides, Stimpson, Shells of New England, 54.
Bulimus sub-cylindricus, Moquin-Tandon, Moll. Fr. ii. 304, pl. 22, figs. 15–19.
Zua lubricoides, Morse, Journ. Portl. Soc. i. 30, figs. 79, 81, 84; pl. 10, fig. 82 (1864); Am. Nat. i. 607, fig. 49 (1868).

Fig. 690.

C. sub-cylindrica.

Shell small, rather larger than a grain of wheat, elongated-oval, obtuse at apex, of a smoky horn color, exceedingly thin and transparent, exhibiting the pillar throughout its whole length; surface very bright and polished; whorls five or six, rounded; suture distinct; lower half of the last volution somewhat tapering towards the base; aperture small, ovate, not broadly rounded at base; lip simple, thickened within, and of a claret tint, inner lip a little thickened so as to give the appearance of a slight notch at

base; umbilicus none. Length, three tenths of an inch; breadth, one tenth of an inch.

Found in woods and groves under leaves and the bark of decaying stumps. On visiting Oak Island, Chelsea, after a warm rain in October, I found the surface of the ground covered with these shells in incalculable numbers. Hundreds might be taken up clinging to a single fallen leaf; as the moisture evaporated they all disappeared beneath the leaves. Mr. Say found this shell in the Northwest Territory.

From Canada to the Red River of the North and English River. In Nebraska. In New England and the States bordering the Great Lakes. Also in Europe.

The above description applies to the shell in its most perfect living state. After death it soon becomes opaque and whitish, and the lip loses its reddish color. In some aspects the peculiar termination of the pillar gives the aperture the look of an *Achatina;* and this is evidently one of the connecting links between the two genera. Indeed, this shell, with a few others, has been set apart by Jeffreys in a new genus, which he calls *Cionella*, characterized by being sub-effuse at base, with the columella partially interrupted.

Genus PUPA, Draparnaud. 1805.

Shell cylindrical, ovate or buliform, rimate or perforate; last whorl proportionally small; aperture semi-oval or sub-rotund, generally furnished with entering, foldlike denticles; peristome expanded, or sub-simple, margins equal, sub-parallel, distant, usually connected with a callous lamina.

Jaw somewhat arcuate, furrowed with delicate striæ, its concave edge unbroken, generally somewhat prominent in the middle.

Lingual band narrow, central teeth tricuspid, laterals bicuspid, uncini serrated.

Most of the species are so small that it requires much care and no little skill to find them. Some are found in forests, under decaying leaves, or fragments of dead branches, lying on the ground, or in the crevices of bark, or about decaying stumps and logs; some are found in plats of moss, others under stones, sticks, etc., in the open fields; and many at the margins of brooks, pools, and ponds, under chips, or crawling up the stems of plants, and seem to

be incapable of existing unless abundantly supplied with moisture, seeming to be aquatic rather than terrestrial in their habits. They feed on decaying vegetable matter, keeping themselves in the shade, and adhering closely to the objects on which they rest when in repose. In the winter they bury themselves under the leaves or in the earth.

Pupa muscorum.

Shell cylindrical, sub-fusiform; whorls six to seven; aperture lateral, nearly circular, with tubercle on the parietal wall; lip slightly reflected; perforate.

Pupa badia, ADAMS, Bost. Journ. iii. 331, pl. 3, fig. 18; Shells of Vermont, 157. — GOULD, Bost. Journ. iii. 404; iv. 360. — DE KAY, N. Y. Moll. 49, pl. 4, fig. 45. — CHEMNITZ, 2d ed. 117, pl. 15, figs. 25–29. — BINNEY, Terr. Moll. 323, pl. 70, fig. 3. — W. G. BINNEY, Terr. Moll. iv. 142.

Pupa muscorum, LINNÆUS, part. — PFEIFFER, Mon. Hel. Viv. iv. 666, &c.

Pupilla badia, MORSE, Journ. Portl. Soc. i. 37, figs. 89, 91; pl. 10, fig. 92 (1864); Am. Nat. i. 609, fig. 52 (1868).

Fig. 691.

P. muscorum.

Shell perforate, cylindrical, sub-fusiform, obtuse at both extremities; epidermis dark chestnut-color, or bay; whorls six to seven, rounded, the anterior four of about equal diameter; suture deep; aperture lateral, nearly circular, small, its diameter equal to two thirds of the diameter of the last whorl, a thin, testaceous deposit forming a thickened margin internally, sometimes bearing an obtuse tubercle; upon the parietal wall is a single tubercle; transverse margin sub-reflected; lip slightly reflected. Length four, breadth one and a half millimetres.

Found in the islands in the Gulf of St. Lawrence, and in Maine, Vermont, and New York. Its range in Europe is very great, being found from Siberia to Sicily, England, Iceland, &c.

Pupa Hoppii.

Shell cylindrically ovate, delicately striated, shining; whorls five; aperture vertical, sub-semi-circular; parietal wall with one tooth; peristome scarcely expanded, sub-perforate.

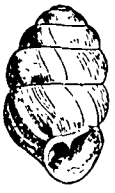
Pupa Hoppii, MÖLLER, Ind. Moll. Gr. 4 (1842). — TROSCHEL, Ar. fur Nat. 1843, ii. 126. — CHEMNITZ, 2d ed. 163, pl. 19, figs. 29, 30. — PFEIFFER, Mon. Hel. Viv. ii. 328; iii. 536; iv. 666. — W. G. BINNEY, Terr. Moll. iv. 147, pl. 78, fig. 20.

Pupa Steenbuchii, BECK teste MÖRCH, Nat. Bidrag. Gr. 75.

Shell sub-perforate, cylindrically ovate, thin, very delicately striated, horn colored, shining, pellucid; spire terminating in an obtuse

cone; whorls five, rather convex, the last scarcely equalling two fifths the shell's length, ascending above, somewhat narrowed towards the base; columella deeply sub-plicate, parietal wall of the aperture furnished with one tooth-like callus; aperture vertical, sub-semi-circular; peristome thin, scarcely expanded, its right termination quite arched. Length two and three fourths, diameter one millimetres.

Fig. 692.



P. Hoppii.

Inhabits Greenland, and has also been found at Anticosti Island.

The description given above is translated from Pfeiffer. The specimen figured, which I refer to this species, has another denticle on the columella, and a lamina-like process within the aperture at the base of the last whorl.

Pupa pentodon.

FIG. 120.

Shell elongated-ovate, obtuse at apex, smooth; whorls five; aperture sub-triangular, armed with nine teeth, the two largest of which are curved; lip white, broadly everted; umbilicated.

Vertigo pentodon, SAY, Journ. Acad. Nat. Sc. ii. 376 (1822); ed. BINNEY, 27.

Pupa pentodon, GOULD, Bost. Journ. Nat. Hist. iv. 353, pl. 16, figs. 10, 11 (1843). — DE KAY, N. Y. Moll. 50, pl. 4, fig. 48; pl. 35, fig. 337 (1843). — PFEIFFER, Mon. Hel. Viv. ii. 359; in CHEMN. ed. 2, 125, pl. 16, figs. 24–26. — BINNEY, Terr. Moll. ii. 328, pl. 12, fig. 1. — W. G. BINNEY, Terr. Moll. iv. 143.

Pupa curvidens, GOULD, Inv. 189, fig. 120 (1841).

Pupa Tappaniana, ADAMS, Sillim. Journ. [1] xl. Suppl.; Vermont Shells, 158 (1842). — PFEIFFER, Symbolæ, ii. 55.

Leucochila pentodon, MORSE, Journ. Portl. Soc. i. 36, fig. 85; pl. 10, fig. 86 (1864); Am. Nat. i. 667, fig. 56 (1868).

Shell minute, ovate, but much elongated; of a spermaceti-white color; whorls five, convex, smooth, gradually diminishing to an obtuse apex; suture deeply impressed; aperture sub-triangular, with the front and outer angles rounded, and the outer lip curved inwards, so as almost to make the aperture heart-shaped; the transverse margin is straight, and slightly oblique; the inner lip is also nearly straight, so that these two form a right angle at their junction; lip widely reflected, flattened, white; throat armed with nine teeth; the longest, somewhat curving to the left, compressed and pointed, is situated on the middle of the transverse lip, and has a small one seated at its left side; at the front, nearly op-

Fig. 693.

P. pentodon.

posite the large tooth, almost as large and inclined to the left also, is a quadrangular blunt tooth, more slightly curved; on the left margin are three teeth, of which the upper one is largest, and about half the size of the basal tooth, of a blunt quadrangular figure; the other two are minute; on the outer lip are also three teeth, of which the two upper are very small and pyramidal; umbilicus open. Length, one fifteenth of an inch; breadth, one fourth of an inch.

Fig. 694.

Teeth of *P. pentodon.*

This minute species I first found under a loose stone on the ledges at Phillips's Point, Lynn, near the Ocean House. It was somewhat broken, so as to give an excellent view of the teeth. Since then I have met with it not unfrequently in damp places, under leaves and boards, in company with *P. modesta.*

From Georgia and Mississippi to the British Possessions.

The shell goes on regularly narrowing both downwards and upwards from the middle of the lower whorl. Four of the teeth are very small, and would scarcely be discerned without being highly magnified, and they seem to be seated farther within the aperture; the small one on the transverse lip, the basal one, and the upper one on the right lip are liable to be wanting.

Pupa decora.

Shell cylindrical, thin, translucent, striated; whorls five or six, rounded; aperture nearly round or semi-oval, with four denticles; peristome slightly reflexed; perforated.

Pupa decora, Gould, Proc. Bost. Soc. Nat. Hist. ii. 263 (Dec. 1847), with a woodcut; in Terr. Moll. ii. 327, pl. 71, fig. 2. — Pfeiffer, Mon. Hel. Viv. iii. 555. — W. G. Binney, Terr. Moll. iv. 143.

Fig. 695.

P. decora. Enlarged.

Shell minute, cylindrical, rounded at apex, thin, shining, translucent, of a wine-yellow color, regularly striated by lines of growth; spire of five or six closely revolving, rounded whorls, deeply separated at the sutures; aperture nearly round or semi-oval, obliquely limited by the penultimate whorl, armed with four slender denticles, the largest of them on the parietal wall, one on the columellar portion of the peristome, and two on the outer portion, all disposed so as to form the arms of a cross; the peristome is slightly reflexed, and indented opposite the base of the two labial

denticles; at the columella it rises against a distinct umbilical perforation. Length two and one half, diameter one and a half millimetres.

Near Lake Superior, Fort Resolution, Great Slave Lake (Kennicott). New England?

Pupa fallax.

FIG. 123.

Shell turreted, dusky; whorls six, smooth, convex; suture distinct; aperture sub-oval; lip widely reflected; umbilicus distinct.

Cyclostoma marginata, SAY, Journ. Acad. Nat. Sc. ii. 172 (1821); BINNEY's ed. 22.
Bulimus marginatus, PFEIFFER, Malac. Blatt. ii. 94; Mon. Hel. Viv. iv. 414. — W. G. BINNEY, Terr. Moll. iv. 136.
Bulimus fallax, GOULD, in Terr. Moll. ii. 288, pl. 52.
Pupa fallax, SAY, Journ. Acad. Nat. Sc. v. 121 (1825); BINNEY's ed. 28. — GOULD, Inv. 192, fig. 123 (1841), excl. syn. *placida;* Bost. Journ. Nat. Hist. iv. 357, pl. 16, fig. 15 (1843). — DE KAY, N. Y. Moll. 51, pl. 35, fig. 331 (1843). — PFEIFFER, Mon. Hel. Viv. ii. 309; iii. 533; in CHEMNITZ, ed. 2 (1844), 58, pl. 12, figs. 20, 21.
Pupa Parraiana, ORBIGNY, Moll. Cuba, 181, pl. 12, figs. 9–11 (1853).
Pupa albilabris, ADAMS, Vermont Moll. 158 (1842); Sillim. Journ. [1] xl. 271.
Pupilla fallax, MORSE, Am. Nat. i. 609, fig. 53 (1868).
Paludina turrita, MENKE? Syn. Meth. 40.

Shell small, turreted, regularly and not rapidly tapering to a somewhat pointed apex; color dusky or light horn color; whorls six, shining, moderately convex, very slightly and finely wrinkled; suture well-impressed; aperture less than one third the length of the shell, rounded oval, somewhat irregular; the preceding whorl forms a nearly transverse boundary above, and is usually enamelled; the pillar lip is nearly straight, and turns abruptly at the front, so as to form nearly a right angle; front broadly curved; outer lip white, widely and equally reflected and thickened; umbilicus distinct. Length, one fifth of an inch; breadth, one fifteenth of an inch.

Fig. 693.

P. fallax.

I have seen but two or three specimens of this shell which have been found in Massachusetts, one of which was sent me by Dr. L. M. Yale, from Martha's Vineyard; I have seen others from Rhode Island. It is found abundantly from Nebraska to Texas, and from New England to South Carolina; also in several of the West India Islands.

Pupa armifera.

Shell cylindrical, smooth; whorls six to seven, convex; aperture nearly oval; teeth commonly four; slightly perforate.

Pupa armifera, Say, Journ. Acad. Nat. Sc. ii. 162 (1821); Binney's ed. 21. — Gould, Bost. Journ. iii. 400, pl. 3, fig. 10 (1840); iv. 359 (1843). — Adams, Vermont Moll. 157 (1842); Sillim. Journ. [1] xl. 271. — Pfeiffer, Symb. ii. 53; Mon. Hel. Viv. ii. 357. — De Kay, N. Y. Moll. 52 (1843). — Binney, Terr. Moll. ii. 320, pl. 70, fig. 4. — Küster, in Chemnitz, ed. 2, 57, pl. 7, figs. 17–19. — W. G. Binney, Terr. Moll iv. 142.

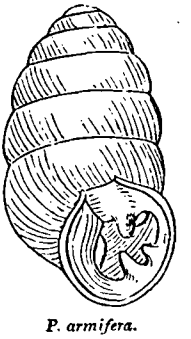
Pupa rupicola, Pfeiffer, Symb. ii. 55, teste Pfeiffer in Mon.

Pupa armigera, Potiez and Michaud, Galerie, i. 159, pl. 16, figs. 1, 2.

Leucochila armifera, Morse, Am. Nat. i. 667, fig. 55 (1868).

Shell cylindrical, sub-fusiform, smooth; whorls six to seven, convex, the three next the aperture of about equal diameter, the posterior three diminishing and forming a rather obtuse apex; suture impressed; peristome white, thin, sub-reflected, forming the whole outline of the aperture except a small portion of the body whorl, where a thin, testaceous deposit connects its two extremities; aperture lateral, nearly oval, deep, cup-shaped, and narrowing towards the throat, which is almost filled up by projecting teeth; white within; teeth commonly four, one of which, affixed to the body whorl, commences at the superior margin of the aperture, near the junction of the peristome and ultimate whorl, and runs backward and downward into the aperture; it is prominent, lamelliform, irregular, has one or more sharp, projecting points, and is sometimes bifid; another, thick and massive, is situated deep in the throat, and marks internally the place of the umbilicus; and two others, projecting and tooth-like, are placed on the peristome at the base of the aperture, and point towards the centre of the aperture; base of the shell, from the umbilicus to the edge of the aperture compressed, forming a short and obtuse keel; umbilicus a little expanded, and slightly perforate. Length, four and two thirds mill.; diameter, two and two thirds mill.; length of aperture, one and two thirds millimetres.

Fig. 697.



P. armifera. Enlarged.

Probably inhabits every State east of the Rocky Mountains.

Pupa contracta.

FIG. 117.

Shell ovate-conical, whitish; whorls five, convex; aperture sub-ovate, lip spreading; throat armed with three teeth, and contracted, by a large concave tooth on the transverse lip, into the form of a horseshoe.

Pupa contracta, SAY, Journ. Acad. ii. 374 (1822); BINNEY's ed. 25 (*Carychium?*). — GOULD, Bost. Journ. iii. 399, pl. 3, fig. 22 (1840); iv. 359 (1843); Inv. 186, fig. 117 (1841). — DE KAY, N. Y. Moll. 49, pl. 4, fig. 47 (1843). — ADAMS, Vermont Moll. 157. — PFEIFFER, Symb. ii. 54; Mon. Hel. Viv. ii. 356. — KÜSTER, in CHEMNITZ, 2d ed. 96, t. 13, figs. 16–18. — BINNEY, Terr. Moll. ii. 324, pl. 70, fig. 2. — W. G. BINNEY, Terr. Moll. iv. 143.

Pupa corticaria, PFEIFFER, Symb. ii. 54 (an var. β? PFR. l. c.).

Pupa deltostoma, CHARPENTIER, in CHEMNITZ, 2d ed. 181, pl. 21, figs. 17–19. — PFEIFFER, Mon. Hel. Viv. iv. 683.

Leucochila contracta, MORSE, Am. Nat. i. 666, fig. 54 (1868).

Shell ovate-conical, of a waxen-white color; whorls five, convex, faintly marked by lines of growth, separated by a well-impressed suture, and gradually tapering to a somewhat pointed apex. Aperture irregularly ovate, about half the width of the lower whorl, broadest above, and somewhat pointed in front; lip widely reflected, not flattened, so as to give a bell-shaped form; throat with three, and perhaps four teeth; a large spoon-shaped one, concave to the right side, seated on the transverse lip, and greatly contracting the throat into something of a horseshoe shape; a very slight undulation near the top of the left lip; an oblong, thin tooth, seated at the front of the pillar, so far within as scarcely to be discerned without breaking the shell; and a minute tooth about the middle of the right lip; umbilicus large and distinct; last whorl indented at some distance behind the outer lip. Length, one tenth of an inch; breadth, one twentieth of an inch.

Fig. 698.

P. contracta.

Found about old stumps and decaying logs, usually under the bark, and near the earth. It has been observed in most parts of Eastern North America.

It is readily known by its whitish, translucent appearance, by its bell-shaped aperture, and especially by its large, spoon-shaped tooth, which gives such a peculiar form to the throat. The teeth at the sides may rather be regarded as inward protuberances of the margin. It appears to be covered with a hairy or glutinous coating, which causes dirt to adhere to it.

Pupa rupicola.

Shell cylindrical, elongated; whorls six; suture deep; aperture semi-circular; teeth five; umbilicus minute.

Pupa rupicola, Say, Journ. Acad. Nat. Sc. ii. 163 (1821); Binney's ed. 22 (*Carychium?*). — Gould, Bost. Journ. iv. 355, pl. 16, fig. 13 (1843). — Pfeiffer, Mon. Hel. Viv. ii. 358. — Chemnitz, 2d ed. 123, pl. 16, figs. 17–19. — De Kay, N. Y. Moll. 52 (1843). — Pfeiffer, Mon. Hel. Viv. iii 557; not Symb. ii. 55. — Binney, Terr. Moll. ii. 341, pl. 70, fig. 1. — W. G. Binney, Terr. Moll. iv. 145.

Pupa procera, Küster, in Chemnitz, 58, pl. 7, figs. 20, 21. — Gould, Bost. Journ. iii. 401, pl. 3, fig. 12 (1840). — Pfeiffer, Mon. Hel. Viv. ii. 360.

Pupa carinata, Gould (olim), 1842, Bost. Journ. iv. 1, cover, p. 3; see also iv. 359 (1843). — Pfeiffer, Mon. Hel. Viv. ii. 359; iii. 557.

Pupa gibbosa, Küster, in Chemnitz, 2d ed 123, pl. 16, figs. 13–16.

Pupa minuta (Say), Pfeiffer, Mon. Hel. Viv. ii. 356; iii. 355; Symb. ii. 54.

Vertigo rupicola, Binney, l. c.

Shell cylindrical, elongated; epidermis brownish horn color; whorls six, convex, the three anterior ones of nearly equal diameter, the three posterior diminishing very slightly and forming an obtuse apex; suture deep; peristome brownish, thickened within, widely reflected; aperture lateral, semi-circular, truncated above by the body whorl; teeth five, one on the middle of the columella, prominent, compressed, emarginate in the middle, and often bicuspid; another at the termination of the axis, marking internally the situation of the umbilicus, conical, and often composed of two or more tubercles; a third in the base of the aperture, a fourth upon the peristome, and a fifth, often massive and prominent, deep in the fauces behind the columellar tooth; umbilicus minute. Length two and a half, diameter one mill.

Fig. 699.

P. rupicola.

From Key West to Arkansas and New England.

Pupa corticaria.

Shell cylindrical; whorls rather more than five; aperture sub-orbicular, with one or two teeth; umbilicus minutely perforated.

Odostomia corticaria, Say, Nich. Encyc. iv. pl. 4, fig. 5, 1st ed. 1817, 2d ed. 1818; Binney's ed. 7, pl. 72, fig. 5.

Pupa corticaria, Say, Nich. Encyc. iv. 3d ed. (1819), pl. 4, fig. 5. — Gould, Bost. Journ. iii. 397, pl. 3, fig. 19 (1840); iv. 358 (1843). — De Kay, N. Y. Moll. 50, pl. 4, fig. 49 (1843). — Küster, in Chemn. 2d ed. 27, t. 13, figs. 19, 20. — Pfeiffer, Mon. Hel. Viv. ii. 328. — Binney, Terr. Moll. ii. 339, pl. 72, fig. 4. — W. G. Binney, Terr. Moll. iv. 146.

Carychium corticaria, Férussac, Podr. No. 3, no descr.

Leucochila corticaria, Morse, Journ. Portl. Soc. i. 36, fig. 87; pl. 10, fig. 88 (1864).

Fig. 700.

P. corticaria.

Shell whitish, shining, cylindrical, obtuse at the apex; whorls rather more than five, convex; suture well-impressed; aperture lateral, two thirds as wide as the last whorl, sub-orbicular, with a single tooth (sometimes two) on the parietal wall near the centre, and a tooth-like enlargement near the umbilical termination of the peristome, which is white, reflected; umbilicus very minutely perforated. Length two and a half, diameter one mill.

From Maine and Wisconsin to South Carolina and Mississippi.

Genus VERTIGO, Müller. 1774.

Shell deeply rimate, ovate, apex acuminate, obtuse; whorls five to six, the last rounded; aperture semi-oval, with from four to seven folds; peristome scarcely expanded, white-lipped.

Lower tentacles wanting.

Jaw smooth, or with longitudinal wrinkles, substriate.

Lingual membrane broad, central teeth tricuspid, laterals bicuspid or serrate, uncini serrate.

Vertigo Gouldii.

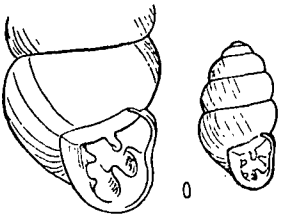
Shell cylindrical ovate; whorls rather more than four; aperture lateral, with five teeth; umbilicus a little open.

Pupa Gouldii, Binney, Proc. Bost. Soc. i. 105 (1843); Terr. Moll. ii. 332, pl. 61, fig. 2. — Gould, Bost. Journ. iv. 352, pl. 16, fig. 9, (1843). — Pfeiffer, Mon. Hel. Viv. ii. 358. — Küster, in Chemnitz, 2d ed. 124, pl. 16, figs. 20–23.

Vertigo Gouldii, Stimpson, Shells of New England, 53, no descr. — W. G. Binney, Terr. Moll. iv. 148. — Morse, Am. Nat. i. 669, fig. 60 (1868).

Isthmia Gouldii, Morse, Journ. Portl. Soc. i. 38, fig. 95; pl. 10, fig. 96 (1864).

Fig. 701.



V. Gouldii.

Shell light chestnut, cylindrical-ovate; whorls rather more than four, ventricose, the last occupying nearly one half the length of the axis; aperture lateral, composed of two unequal curves meeting in the centre of the peristome, with five prominent white teeth, namely, one upon the transverse margin, two upon the umbilical margin, and two upon the labial margin; peristome thickened, not reflected; umbilicus a little open. Length two, diameter one mill.; aperture two thirds long.

From Maryland through New England.

Vertigo milium.

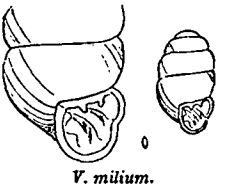
FIG. 118.

Shell sub-oval, wrinkled, light chestnut colored; whorls four; suture moderate; aperture heart-shaped, armed with six teeth; umbilicus free.

Pupa milium, GOULD, Bost. Journ. iii. 402, pl. 3, fig. 23 (1840); iv. 359 (1843); Inv. 187, fig. 181 (1841). — DE KAY, N. Y. Moll. 48, pl. 4, fig. 44 (1843). — ADAMS, Vermont Moll. 153 (1842). — PFEIFFER, Mon. Hel. Viv. ii. 362. — BINNEY, Terr. Moll. ii. 337, pl. 71, fig. 1. — KÜSTER, in CHEMN. 2d ed. 119, pl. 15, figs. 39–42.
Vertigo milium, W. G. BINN. T. M. iv. 148. — MORSE, Am. Nat. i. 669, figs. 65, 66 (1868).

Shell minute, of a nearly oval form, color a light chestnut; whorls four, or somewhat more, obviously wrinkled, rather convex, arranged so as to form a bluntly rounded apex; suture deep; aperture half the width of the last whorl, heart-shaped, the apex being its right upper angle; the transverse margin is nearly direct, the outer margin is scalloped by an indentation of the lip; the remainder of the margin is regularly rounded; lip white, slightly everted; throat with six teeth, two of which are on the transverse lip, equidistant; one with a tubercle at its base, on the middle of the left lip, and nearly at right angles with the former is the largest; a fourth is on the indenture of the outer lip, directed between the two on the transverse lip; and two smaller ones, more retired within the shell, are equidistant between the two last mentioned; umbilicus large and deep. Length, less than one thirtieth of an inch; breadth, one fortieth of an inch.

Fig. 702.



V. milium.

This shell I first found in November, 1839, at Oak Island, Chelsea, after a warm rain. Professor Adams has found it in Vermont. It was crawling on the damp leaves, in company with *Cionella subcylindrica*. From New England to Texas.

Not finding any description answering to it, I have proposed a name. It is even more minute than *Carychium exiguum*, and is not readily detected. In size and outline it resembles *P. vertigo*, Drap., *V. pusilla* of other authors; but that shell is reversed, and has a different armature. The teeth are all distinct, long, compressed, and very sharp.

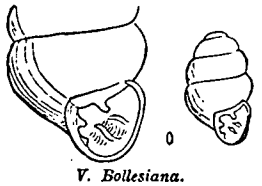
I have labored to make this out to be the *P. ovata* of Say; but on the whole I think the discrepancies are too important to be reconciled. That shell is described as larger, with a semi-oval aperture, and with seven teeth, differently arranged from those of our shell.

Vertigo Bollesiana.

Shell cylindrical ovate; whorls four, sub-convex; aperture sub-orbicular; teeth five; minutely perforate.

Isthmia Bollesiana, MORSE, Ann. N. Y. Lyc. viii. 209, figs. 4–6 (Nov. 1865).
Vertigo Bollesiana, MORSE, Am. Nat. i. 669, figs. 63, 64 (1868).

Fig. 703.



V. Bollesiana.

Shell minutely perforate, cylindrical-ovate, delicately striated, sub-translucent; apex obtuse; suture well-defined; whorls four, sub-convex; aperture sub-orbicular, somewhat flattened on its outer edge; with five teeth, one prominent and rather curved on the parietal margin, two similar in form, the lower one the smaller, on the columellar margin, and two slightly elevated lamelliform teeth within and at the base; peristome sub-reflected and thickened. Length, sixty-five thousandths of an inch; breadth, thirty-five thousandths of an inch. (*Morse.*)

New England; New York; Virginia.

Vertigo ovata.

FIG. 119.

Shell ovate-conic, amber colored; whorls five or six, convex, wrinkled; aperture semi-oval, broader than long; teeth five; umbilicus distinct.

Vertigo ovata, SAY, Journ. Acad. Nat. Sc. ii. 375 (1822); ed. BINNEY, 26. — BINNEY, Terr. Moll. ii. 334, pl. 71, fig. 4. — W. G. BINNEY, Terr. Moll. iv. 148. — MORSE, Am. Nat. i. 668, figs. 57, 58 (1868).

Pupa ovata, GOULD, Bost. Journ. N. H. iv. 350, pl. 16, figs. 7, 8 (1843). — DE KAY, N. Y. Moll. 50, pl. 4, fig. 50 (1843). — ADAMS, Vermont Moll. 157 (1842); Sillim. Journ. [1] xl. 271. — KÜSTER, in CHEMN. ed. 2, 118, pl. 14, figs. 1, 2; pl. 15, figs. 35–38. — PFEIFFER, Mon. Hel. Viv. ii. 360; Symb. ii. 54.

Pupa modesta, SAY, Long's Ex. ii 25, pl. 15, fig. 5 (1824); ed. BINNEY, 32, pl. 74, fig. 5. — GOULD, Inv. 188, fig. 119 (1841).

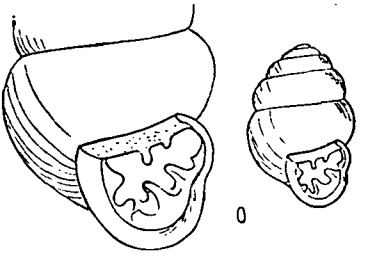
Pupa ovulum, PFEIFFER, olim, Symb. 46.

Isthmia ovata, MORSE, Journ. Portl. Soc. i. 38, fig. 93; pl. 10, fig. 94 (1864).

Shell minute, ovate-conic, thin, amber colored, whorls five; sometimes six, minutely wrinkled, well-rounded, and defined by a deep suture, gradually diminishing to a rather acute apex; aperture about half the breadth of the last whorl, slightly oblique; rather broader than long; semi-oval, but modified by an inflection of the outer lip; lip simple, not reflected, joining the preceding whorl behind, by a curve; teeth five, slender, sharp and direct, like the teeth of a

comb; one on the middle of the transverse lip, a still larger one at right angles on the middle of the pillar lip, a minute one at the front of the pillar, and two farther within the shell, one opposite the tooth on the transverse lip, the other on the indentation of the outer lip; umbilicus small, distinct. Length, three fortieths of an inch; breadth, one twenty-fifth of an inch.

Fig. 704.



V. ovata.

Inhabits damp, rich places near water, or in fertile fields under bits of board, chips, sticks, &c. It was first noticed in this region by Mr. T. J. Whittemore, at Cambridge. From Maine to Texas. Also quoted from Mexico and Cuba.

It is a very small, but interesting shell; double the size, however, of *V. milium*, and of a much more conical shape. Their color is similar. In their armature the two are very different. The pillar lip is somewhat broad and flattened.

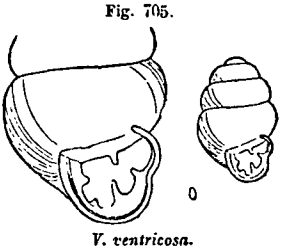
Mr. Say describes only four teeth, but the small one at the base of the pillar probably escaped his observation, as it would only be seen under a high magnifier. One of the teeth on the right lip is often wanting. I have occasionally noticed a specimen with two, and even three, teeth upon the transverse lip.

Vertigo ventricosa.

Shell ovate-conic, smooth; whorls four; aperture semi-circular, with five teeth; umbilicated.

Isthmia ventricosa, MORSE, Ann. N. Y. Lyc. viii. 1, figs. 1–3 (Nov. 1865).
Vertigo ventricosa, MORSE, Am. Nat. i. 669, figs. 61, 62 (1868).

Fig. 705.



V. ventricosa.

Shell umbilicate, ovate-conic, smooth, polished; apex obtuse; suture deep; whorls four, convex; aperture semi-circular, with five teeth, one prominent on the parietal margin, two smaller on the columellar margin, and two prominent within, contracting the aperture at the base; peristome widely reflected, the right margin flexuose, within thickened and colored. Length, seven hundredths of an inch; breadth, forty-five hundredths of an inch. (*Morse*).

Maine, New Hampshire, and New York.

I have not seen this species. Mr. Morse says it has been confounded with *V. ovata*, but is one fourth smaller, has one whorl less, and a more circular columellar margin to the aperture, &c.

Vertigo simplex.

Fig. 121.

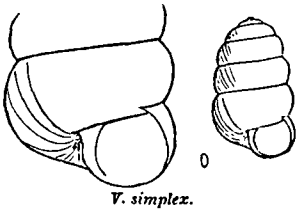
Shell minute, cylindrical-ovate, smooth; whorls five; aperture circular, toothless; umbilicated.

Pupa simplex, Gould, Bost. Journ. Nat. Hist. iii. 403, pl. 3, fig. 21 (1840); iv. 359 (1843); Inv. 190, fig. 121 (1841). — Pfeiffer, Mon. Hel. Viv. ii. 302. — De Kay, N. Y. Moll. 52, pl. 36, fig. 347 (1843). — Binney, Terr. Moll. ii. 343, pl. 72, fig. 3.

Vertigo simplex, Stimpson, Shells of New England, 53 (no descr.). — W. G. Binney, Terr. Moll. iv. 148. — Morse, Am. Nat. i. 670, figs. 67, 68 (1868).

Shell minute, two thirds of the shell cylindrical, surmounted by a rapidly formed, blunt apex, smooth, light chestnut colored. Whorls five, moderately convex, separated by a distinct suture, quite smooth; aperture circular, except for a small section from the posterior portion, which is cut off by the encroachment of the preceding whorl; lip simple and sharp, slightly everted on the left side, and partially hiding a small umbilicus. No trace of a tooth has been detected in any of the specimens examined. Length, one fifteenth of an inch; breadth, one thirtieth of an inch.

Fig. 706.



V. simplex.

The locality where this was first found is a small grove, a little northward of Fresh Pond in Cambridge. In this place it has been found among the moist leaves, on three successive visits in the months of May and June, in company with *Helix lineata*, *labyrinthica*, *chersina*, and *indentata*, and *Pupa modesta*. None of the shells exhibit any trace of a tooth, although their aspect, and the season of the year, indicate that they can be none other than adult shells. Indeed, were it not for the infringement of the last whorl but one on the aperture, we might rather refer the shell to *Cyclostoma* than to *Pupa*. It occurs in Canada and New England.

It is rather smaller than *P. modesta*, and about the size of *P. pentodon;* but the simplicity of the unarmed, circular aperture distinguishes it from every American species. The aperture of *P. modesta*, before the development of the teeth, is broader than long. It is the analogue of the *Vertigo edentula* of Europe.

Genus SUCCINEA, Draparnaud. 1801.

Shell imperforate, thin, ovate or oblong; aperture large, obliquely oval; columella simple, acute; peristome simple, straight.

Jaw with a sub-quadrate plate attached to its convex margin; strongly arcuate, ends pointed; anterior surface smooth; concave margin simple, with a rostriform median projection.

Lingual membrane with curving transverse series of teeth; centrals tricuspid; laterals bicuspid; uncini serrate.

Succinea ovalis.

Fig. 125.

Shell sub-oval, pellucid, straw colored; whorls three, oblique; aperture large, ovate.

Succinea ovalis, Gould, Inv. 194, fig. 125 (1841). — Adams, Vermont Moll. 270. — Binney, Terr. Moll. ii. 78, pl. 67 *a*, fig. 3. — W. G. Binney, Terr. Moll. iv. 37. — Pfeiffer, Mon. Hel. Viv. iv. 814. — Morse, Journ. Portl. Soc. i. 30, fig. 77; pl. 9, fig. 78 (1864); Am. Nat. i. 607, fig. 48 (1868). — Tryon, Am. Journ. Conch. ii. 237, pl. 2, fig. 22 (1866). — Not of Say.

Succinea Decampii, Tryon, Am. Journ. Conch. ii. 237, pl. 2, fig. 23 (1866).

Shell ovate, somewhat conic, very thin, pellucid, watery horn color, sometimes tinted roseate; peristome shining, very minutely striate; whorls three, the last compressed and elongate when viewed above; spire short but acute; suture impressed; aperture produced by a deep truncation of the shell, elongated, more than three fourths the length of the shell, patulous, expanding anteriorly, exhibiting the interior of the volutions; when viewed on the side of the aperture, the conical shape of the shell appears, the broadest part of the cone is below the centre of the aperture, and it tapers gradually to the apex. Extreme length, fifteen mill.; of aperture, ten millimetres.

Fig. 707.

S. ovalis.

Canada and the Northern and Middle States.

This is not the *S. ovalis* of Say. That shell having been found identical with *S. obliqua*, Dr. Gould proposed retaining the name *ovalis* for this species.

This species is found about the margins of ponds, and low, damp places, where the surface is always moist. It crawls over the mud, or up the stalks of plants; and although it seems to be but little incommoded by water, it cannot endure being entirely submerged,

and seems not to have the power of directing its way in the water, though it will generally float.

The animal is larger than the shell; its color pale, with minute black points, which are assembled into stripes upon the neck, and into squares, or bands, upon the sides; the neck is granulate above; a black line passes each side on the neck, from the tip of the tentacula, disappearing under the shell. The shell is so vitreous, that all the markings of the animal and colors of the viscera are seen through it, as are also the circulating vessels branching across the back, and the heart pulsating, and sending the fluids through them.

Further particulars will be stated under *S. obliqua.*

Succinea avara.

Fig. 127.

Shell very thin, wrinkled, yellowish, whorls three, rounded; suture deep; aperture rounded, ovate, more than half as long as the shell.

Succinea avara, Say, Long's Exped. ii. 260, pl. 15, fig. 6 (1822); Binney's ed. 32, pl. 74, fig. 6. — Gould, Inv. 196, fig. 127 (1841). — Adams, Vermont Moll. 156 (1842). — De Kay, N. Y. Moll. 54, pl. 4, fig. 55 (1843). — Pfeiffer, Symb. ii. 56; Mon. Hel. Viv. ii. 525; in Chemnitz, 2d ed. 51, pl. 5, figs. 18–20 (1854). — Binney, Terr. Moll. ii. 74, pl. 67 c, fig. 4. — W. G. Binney, Terr. Moll. iv. 35. — Morse, Journ. Portl. Soc. i. 29, fig. 75; pl. 9, fig. 76 (1864); Am. Nat. i. 607, fig. 47 (1868). — Tryon, Am. Journ. Conch. ii. 233, pl. 2, figs. 11, 12 (1866).

Succinea Wardiana, Lea, Proc. Am. Phil. Soc. 1841, ii. 31; Tr. ix. 3; Obs. iv. 3 (1844). — Pfeiffer, Mon. Hel. Viv. ii. 525.

Succinea vermeta, Say, teste Gould (see doubtful species). — Tryon, Am. Journ. Conch. ii. 233, pl. 2, fig. 10 (1866).

Shell rather small, very thin and fragile, of a deep straw color; surface irregularly wrinkled; whorls about three and a half, well rounded, and separated by a deep suture, the last whorl composing the greater part of the shell, but not very broad; aperture in adult and elongated shells, about half as long as the shell, but generally proportionally shorter, of a rounded form, the curve of the outer lip, where it joins the preceding whorl, being so great as to render the aperture nearly as broadly rounded behind as in front. Length, seven twentieths of an inch; breadth, five twentieths of an inch; divergence, fifty-six degrees.

Fig. 708.

S. avara. Enlarged.

A larger form is also found.

Found about the margins of muddy streams, or sheltered under loose objects lying about moist places. From Fort Simpson on

Mackenzie River to the Gulf of Mexico, over all Eastern North America.

I have much hesitation in deciding upon a name for this shell. It is quite different from any other species I am acquainted with. The spire is longer, and acutely pointed, the body whorl less developed, and the aperture is shorter and more rounded; but, although the suture is deep, it is not so much so as to "give the whorls the appearance of being almost separated from resting on each other," as Mr. Say remarks of *S. vermeta*. In this character, individuals differ very greatly. Some specimens with unusually lax spires may have been used by Mr. Say in drawing up his description. But the young shells present no prominent spire, and a large, rounded aperture, agreeing precisely with Mr. Say's description and figure of *S. avara;* and they are also always coated with earth adhering to a glutinous matter on the surface. It seems probable that the two should form one species; unless they do, I am at a loss under which name to place our shell, as, considering specimens of all ages and forms, it will come under one as well as the other. The name I have chosen is to be preferred, because it is a legitimate Latin word, while the other is not.

The animal has a dark head, and gives a dark color to the shell; the foot is very narrow, with a flesh-colored tint.

Succinea obliqua.

FIG. 126.

Shell ovate, thin, transparent, pale yellow; whorls three, not very oblique, very convex; the last very large and turgid; suture deep; aperture sub-oval.

Succinea obliqua, SAY, Long's Exped. ii. 260, pl. 15, fig. 7 (1824); BINNEY's ed. 32, pl. 74, fig. 7. — ADAMS, Vermont Moll. 156, with fig. (1842). — DE KAY, N. Y. Moll. 53, pl. 4, fig. 53 (1843). — PFEIFFER, Mon. Hel. Viv. iii. 15; in CHEMNITZ, 2d ed. 47, pl. 5, figs. 1, 2 (1854). — BINNEY, Terr. Moll. ii. 69, pl. 67 *b*, fig. 3, excl. syn. *Totteniana*. — W. G. BINNEY, Terr. Moll. iv. 35; Terr. Moll. U. S. i. 258, pl. 13, figs. 1–3 (1851), anat. — TRYON, Am. Journ. Conch. ii. 232, pl. 2, fig. 7 (1866).

Succinea ovalis, SAY, J. Ac. N. S. i. 15 (1817); Nich. Encyc. 3d ed. (1819): BINNEY's ed. 8. — ADAMS, Vermont Moll. 156 (1842). — DESHAYES, in Encyc. Méth. ii. 20 (1830); FÉR. Hist. l. c. ii. 139 (excl. syn. GOULD); in LAM. 2d ed. viii. 319. — PFEIFFER, Mon. Hel. Viv. ii. 524; iii. 15 (excl. syn. GOULD); in CHEMNITZ, 2d ed. 48, pl. 5, figs. 3, 4.

Succinea lineata, DE KAY, N. Y. Moll. 53, pl. 4, fig. 51 (olim), 1843.

Succinea campestris, of all American authors except SAY. — GOULD, Inv. 195, fig. 126 (1841). — DE KAY, N. Y. Moll. 54, pl. 4, fig. 54 (1843).

Succinea Greerii, TRYON, Am. Journ. Conch. ii. 232, pl. 2, fig. 18 (1866).

The general resemblance between this species and *S. ovalis* is very great. It differs, however, in some well-marked particulars. It attains a much larger size, is thicker and less fragile; its color is darker, having a somewhat smoky tinge. Its form is much more robust, the breadth being proportionally greater; the whorls are much more convex and tumid, being regularly inflated, while the upper portion of the large whorl of *S. ovalis* is compressed, so that its broadest portion is somewhat below the middle. The whorls are less oblique. The aperture is more oval, being nearly as broadly rounded above as below. Common length, three fifths of an inch; breadth, two fifths of an inch; divergence, eighty degrees to ninety degrees.

Fig. 709.

S. obliqua.

It is more commonly found in moist places, but spreads itself over rich or cultivated ground, whether lowland or upland, and may be found in dry weather partially sheltered by sods, or lying along by the side of stones, where it may enjoy the benefit of the moisture condensed by these bodies.

The animal is very similar to that of *S. ovalis*, but in general the markings are darker, and the marbled appearance which its viscera exhibit through the transparent shell combines yellow instead of whitish colors. Radiating lines of furrows also are quite conspicuous on the posterior part of the foot.

From Gaspé to Georgia, and from the Red River of the North to Arkansas. It is also found fossil in the post-pleiocene bluffs on the Mississippi River.

It is extremely probable that this is, after all, the *S. amphibia* of Europe. No distinct and constant difference can be pointed out between them. In specimens of the foreign shell which I have seen, the surface may perhaps be a little more glossy, and the shell may have somewhat more of an appearance of solidity. Like that shell, too, it varies considerably in the prominence of its spire.

Succinea Totteniana.

Shell obliquely-ovate, greenish color, thin; whorls three, convex, the last very large and globose; suture impressed; aperture oval.

Succinea Totteniana, Lea, Proc. Phil. Soc. ii. 32 (1841); Proc. Am. Phil. Soc. ix. 4 (1844); Obs. iv. 4. — Pfeiffer, Mon. Hel. Viv. ii. 526; iii. 15. — Gould, in Terr. Moll. ii. 65, 72, pl. 67 *b*, fig. 2. — W. G. Binney, Terr. Moll. iv. 35. — Morse,

Journ. Portl. Soc. i. 29, fig. 73; pl. 9, fig. 74 (1864); Am. Nat. i. 606, fig. 46 (1868). — TRYON, Am. Journ. Conch. ii. 230, pl. 2, fig. 1 (1866).
Succinea obliqua, teste BINNEY, l. c.

Shell obliquely-ovate, of a greenish color, thin, shining, somewhat diaphanous, obsoletely striated; whorls three, convex, the last very large and globose; spire very short; suture impressed; aperture large, oval, oblique; peristome thin, acute. Greatest length, sixteen millimetres.

Fig. 710.

S. Totteniana.

New England and New York.

Generally considered a variety of *S. obliqua*. It is a thinner and more fragile shell, proportionally more ventricose in form, with a shorter spire and larger aperture; it has a decided green color, almost unshaded with yellow, while in *S. obliqua* the amber yellow predominates.

FAMILY ARIONIDÆ.

LINGUAL membrane with numerous similar transverse rows of teeth.

Jaw smooth, with a central projection, or ribbed and having no central projection.

Body elongate, attached its whole length to the upper surface of the foot, or more or less spiral and prominent on the middle of the upper surface of the foot. Eyes at the end of long, cylindrical, retractile peduncles; tentacles shorter, retractile. Mantle thin, small, discal or spiral, on the middle of the back; respiratory orifice subcentral, on the right side. Foot narrow, elongate, usually with a distinct locomotive disk, with a posterior distinct gland. Vent near the respiratory orifice. Orifice of reproductive organs usually behind the right peduncle, or below the respiratory orifice.

Shell thin, shining, peritreme acute, simple or sometimes internal and rudimentary.

This family contains numerous genera and species found in every quarter of the globe. In North America it is represented by only two genera, *Arion* and *Zonites*. Their habits are respectively the same as those of *Limax* and *Hyalina*.

The shell exists in various stages of development in the *Arionidæ*, some containing a portion of the animal in spiral, in others being

internal, and the body attached to the foot in its whole length. This and the characteristics of the mucus-pore have suggested the two sub-families, *Arioninæ* and *Zonitinæ*.

Genus ARION, Férussac. 1819.

Posterior termination of body obtuse. Integuments crowded with elongated tuberosities on the back, and on the sides with elongated tubercular plates having furrows between. Mantle anterior, oval, small, covered with granulations, free at the front and on the sides, attached posteriorly, containing in its posterior part numerous fine, calcareous sandy grains. Locomotive disk not expanded at the margin, when the animal is fully extended very narrow, having in some species a narrow median band, and in others not. Respiratory orifice at the anterior margin of the mantle, small. Anal orifice contiguous to the former. Orifice of organs of generation under the two last. On the upper part of the posterior extremity of the body is a triangular pore or sinus, with the point directed forwards, a process or projection of the integument serving as a cover to the sinus.

Jaw with anterior ribs and marginal denticulations, broad, crowded.

The lingual ribbon is broad, composed of a median row of tricuspid denticles, the central toothlet of each being long and acutely pointed, the side toothlets short and blunt. The lateral teeth are modifications of the central, thirty-one in number, but bicuspid, the inside toothlet of the central being omitted in the laterals on the side nearest the central line, and the teeth gradually changing as they pass off laterally.

The genus *Arion* was separated from *Limax* by M. Férussac, to contain those species of the latter genus having a terminal pore or sinus. It is universally recognized and has been fortunate in escaping any confusion of synonymy.

The internal calcareous grains which represent the shell are in some species isolated, in others aggregated into a nearer resemblance to the internal plate of *Limax*. On this distinction are based the sub-genera *Lochea* and *Prolepis*.

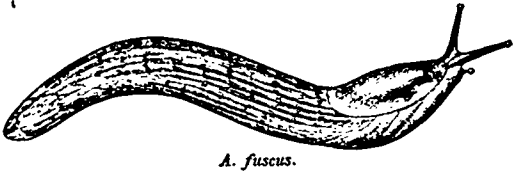
Arion fuscus.

Color whitish or light ashy, sometimes with a tinge of brown, or dark grayish; body cylindrical, narrow, expanding a little towards its extremity, ending in a flat and rounded termination; head darker than the body, projecting very little beyond the mantle; mantle small, oval, narrow; disk of the foot whitish. A triangular mucus-pore on the upper surface of the posterior extremity.

Limax fuscus, Müller, Hist. Verm. ii. 11 (1774).
Arion hortensis, Férussac, Hist. 65, pl. 2, figs. 4, 6; Suppl. pl. 96 *a* (1819). — Binney, Bost. Journ. N. H. iv. 170 (1842); Terr. Moll. ii. 27, pl. 64, fig. 1; pl. 65, fig. 2 (1851). — Leidy, Terr. Moll. U. S. 249, pl. 2, figs. 1–4, anat. (1851). — De Kay, N. Y. Moll. 23 (1843). — Reeve, Brit. L. and Fr. W. Moll. 11, figs.
Arion fuscus, Moquin-Tandon (which see for further foreign synonymes).

Color whitish or light ashy, sometimes with a tinge of brown, or dark grayish; an obscure, ill-defined, dark colored line or band rises where the mantle meets the bases of the tentacles on both sides, and, extending along the whole length of the mantle to its posterior extremity, converges towards the line of the opposite side; another band, proceeding from under the posterior edge of the mantle, not quite continuous with the above described line, runs along the sides of the body to its extremity. Body cylindrical, narrow, when extended very much elongated; expanding a little towards its extremity, and ending in a flat and rounded termination; its upper surface is covered with narrow, oblong, prominent glands, appearing sometimes as if carinated, and arranged in parallel rows, the flanks with elongated tuberculated plates and finer granulations. Head darker than the body, projecting very little beyond the mantle. Eye-peduncles blackish, one eighth the length of the body, stout, bulbs translucent, ocular spot at the superior part, black. Tentacles immediately under the eye-peduncles, very short, conical. Mantle small, oval, narrow, commencing just behind the insertion of the eye-peduncles, less than one third of the length of the animal; covered with granulations tending to a vermiform shape. Disk of the foot whitish, without a separate locomotive band, the marginal boundary between it and the body marked by a furrow, projecting beyond the body posteriorly. Respiratory foramen small, with a cleft to the margin of the mantle. Between the eye-peduncles is a tubercular ridge with

Fig. 711.



A. fuscus.

furrows on each side. The triangular mucus-pore is on the upper surface of the posterior extremity, is very apparent, and has a process of the skin which seems to cover it, and sometimes to project above it. When fully grown the extreme length is more than fifty mill., its usual length about twenty-five millimetres.

Internal granulations coarsely united or aggregated into a somewhat ovular, semi-transparent, very granular plate.

When the animal is fully extended, the mantle occupies less than a fourth part of its whole length, and the dark lines on the mantle and back are continuous with each other. The head only projects from the mantle, the neck not being visible. Its surface is constantly covered with a watery mucus, and it suspends itself with a thread of mucus like the other species. The mucous secretion from the terminal pore is transparent and very viscid.

It is not distinguished by any considerable variety of color or markings. It occurs in small numbers in the vicinity of Boston, under stones, at roadsides, in company with *Limax agrestis*, and more plentifully in gardens within the city. In the remarks on this species, formerly published by Dr. Binney, he hesitated in considering it to be identical with the foreign species of the same name. Having since found it somewhat numerous in a locality in Boston, he procured specimens agreeing very well with foreign descriptions and figures, especially with that variety described by M. Férussac as "*griseus, unicolor, fasciis nigris*," and had no longer any doubt on the subject. The specimens found in gardens are, however, much larger than the size indicated by the descriptions. It is called a small species by both M. Férussac and M. Lamarck, and so it is, as it exists in the country; but in the city it is sometimes two inches in length, when not fully extended, and of a corresponding bulk. The dark lines are most strongly marked in the large variety. The small variety is more delicate in its markings, and has a tinge of yellow on the foot. It is still restricted in its distribution, so far as known, to the neighborhood of Boston alone.

Genus ZONITES, Montfort. 1810.

Shell broadly umbilicated, orbiculate, convex or discoidal, striated or decussated, beneath smooth and shining; whorls six or seven, gradually increasing in size; aperture oblique and lunate; peristome straight, acute, and slightly thickened internally.

Animal with a caudal mucus-pore.

Jaw arcuate, large, simple, concave margin with a strong median projection.

Lingual membrane broad, teeth long and slender, central tricuspid, lateral bicuspid, uncini aculeate, curved. The central and lateral teeth are arranged in straight, transverse rows, the uncini in somewhat diagonal rows, thus dividing the lingual membrane into three distinct transverse sections.

The species of this genus are allied to the *Hyalinæ* by the character of the shell, jaw, and lingual dentition, but differ from them in the presence of the caudal mucus-pore.

Zonites inornata.

Shell depressed, smooth, shining; whorls five; aperture transverse, obliquely lunar; peristome thin, acute; umbilicus small.

Helix inornata, Say, Journ. Acad. ii. 371 (1821); Binney's ed. 24. — Binney, Bost. Journ. Nat. Hist. iii. 419, pl. 21, fig. 3 (1840); Terr. Moll. ii. 227, pl. 34. — De Kay, N. Y. Moll. 39 (1843). — Adams, Vermont Moll. 161 (1842). — Pfeiffer, Mon. Hel. Viv. i. 84; iv. 48. — W. G. Binney, Terr. Moll. iv. 109. — Morse, Am. Nat. i. 314, figs. 19, 21, 22 (1867).

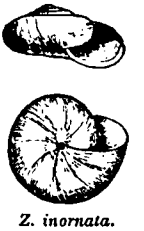
Helix glaphyra, Pfeiffer, olim, Symb. ii. 29, excl. syn. *fuliginosa;* Mon. Hel. Viv. i. 57, not Say. — Reeve, Con. Icon. 667.

Helix inornata, Binney, not Say; Bland. Ann. N. Y. Lyc. vii. 127.

Hyalina inornata, Tryon, Am. Journ. Conch. ii. 249, pl. 4, fig. 22 (1866).

Shell depressed; epidermis yellowish horn color, smooth, shining, with very minute lines not breaking the smoothness of the surface; whorls five; suture not much impressed; aperture transverse, scarcely oblique, obliquely lunar, with a thick, white, testaceous deposit around its whole inner surface, a little distant from the margin; peristome thin, acute, fragile, its ends somewhat converging, the columellar margin reaching to the centre of the base, sub-dilated above; umbilicus small; base rather flattened, indented in the centre. Greater diameter, sixteen mill.; lesser, twelve and a half mill.; height, six millimetres.

Fig. 712.



Z. inornata.

From North Carolina to Kentucky through the States bordering on the great lakes. In the western parts of New England it is found, but very rarely. Berkshire County, Massachusetts (*Binney*).

Animal with head, neck, and eye-peduncles bluish-black; foot whitish. Eye-peduncles long and slender. A marginal furrow extending along the edges of the foot, and uniting above and before

its posterior termination. Behind the junction is a prominent, subconical, bluish white gland, on the extremity of the foot.

The shell which is described above is well known in collections, and not easily confounded with any other. It has been unfortunate in its synonymy, whose history is treated at length and explained in the fourth volume of the "Terrestrial Mollusks" and "Annals of the New York Lyceum," quoted above.

I have in my collection a curious specimen from the Pennsylvania mountains, in which are three well-developed, sharp, tooth-like processes on the internal thickened margin of the peristome.

Zonites suppressa.

Shell convex-depressed, thin; whorls six; aperture transverse; peristome simple, one or two lamelliform teeth within; umbilicus small.

Helix suppressa, Say, New Harm. Diss. ii. 229 (1829); Descr. 14; Binney's ed. 36. — Binney, Bost. Journ. iii. 410, pl. 11, fig. 3; Terr. Moll. ii. 253, pl. 37, fig. 1. — De Kay, N. Y. Moll. 38, pl. 3, fig. 24 (1843). — Reeve, Con. Icon. 723. — W. G. Binney, Terr. Moll. iv. 122. — Pfeiffer, Mon. Hel. Viv. iv. 153. — Morse, Am. Nat. i. 411, fig. 25 (1867).

Helix gularis, var. β, Pfeiffer, Chemnitz, 2d ed. &c.

Gastrodonta suppressa, Tryon, Am. Journ. Conch. ii. 258, pl. 4, fig. 41 (1866).

Shell convex-depressed, thin, pellucid; epidermis polished, yellowish horn color; spire flat; whorls six, with crowded, minute, oblique striæ; suture impressed, distinct; aperture transverse, not expanded; peristome simple, thin at its edge, thickened within; base rather convex, near the aperture opaque, yellowish-white; umbilicus small, but rounded and distinct in young shells, obsolete or hardly apparent in older ones; within the peristome are one or two lamelliform, elongated, oblique teeth. Greater diameter, five mill.; lesser, four mill.; height, two millimetres.

Fig. 713.

Z suppressa. Enlarged.

From Florida to Pennsylvania. New England (*Morse*).

Zonites fuliginosa.

Shell thin, depressed; whorls four and a half; aperture very oblique, lunate-ovate; peristome simple; umbilicus deep.

Helix fuliginosa, Griffith in letters. — Binney, Terr. Moll. ii. 222, pl. 31; Bost. Journ. iii. 417, pl. 24, excl. syn. (1840). — Leidy, in Terr. Moll. U. S. i. pl. 9, fig. 4, anat. — Adams, Vermont Moll. 161, excl. syn. (1842). — De Kay, N. Y. Moll. 37, pl. 3, fig. 22 (1843). — Pfeiffer, Mon. Hel. Viv. i. 88; in Chemn. 2d ed. ii. 104, pl. 84,

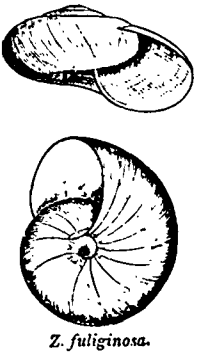
figs. 1–3. — Reeve, Con. Icon. 675 (1852). — W. G. Binney, Terr. Moll. iv. 105. — Morse, Am. Nat. I. 315, figs. 23, 24 (1867).

Helix capillacea, Pfeiffer, Symb. ii. 24, not Fér. teste Pfr.

Omphalina cuprea, Rafinesque, Enum. and Acc. 3; ed. Binney and Tryon, 67

Hyalina fuliginosa, Tryon, Am. Journ. Conch. ii. 248, pl. 3, fig. 16 (1866).

Fig. 714.



Z. fuliginosa.

Shell thin, depressed on the upper surface; epidermis dark, approaching to chestnut color, shining and smooth, wrinkled; whorls four and a half, rapidly increasing, with irregular oblique wrinkles, the last whorl very voluminous, and expanding transversely towards the aperture; suture very little impressed; aperture very oblique, ample, lunate-ovate, within pearly or iridescent; peristome simple, thin, brittle, with a light, testaceous deposit within, the two terminations approaching each other very nearly, that of the columella somewhat reflected; umbilicus deep, not much expanded. Greater diameter, twenty-six mill.; lesser, twenty-two mill.; height, thirteen millimetres.

Has been found in nearly all the Northern, Western, Middle, and some of the Southern States. In one case I have known of its being found at the northern side of Lake Superior.

Family PHILOMYCIDÆ.

Lingual membrane very broad, teeth uniform, in numerous close, straight, transverse rows, the central large, obtusely conical, broad, laterals the same, the inner ones surmounted by a pointed apex.

Jaw horny, arcuate, strongly striated, its extremities blunt, concave margin irregular, scarcely bluntly projecting in the centre, vertically convex in the middle.

Animal limaciform, elongated, tapering behind. Eyes at the end of retractile cylindrical peduncles; tentacles short. Mantle thin, large, entirely covering the back. Respiratory orifice on the right side near the head, above the edge of the mantle. Foot narrow, elongate, simple, posteriorly extending beyond the mantle, no locomotive disk. Vent a little above and before the respiratory orifice. Male and female organs with the same orifice behind and below the right eye-peduncle.

No internal shell.

Genus TEBENNOPHORUS, Binney. 1842.

Body somewhat flattened, terminating obtusely, or in a somewhat truncated form. Back convex, more flat when fully extended. Integuments with irregular vermiform glands, anastomosing with each other, and having a general longitudinal direction. Mantle covering

Fig. 715.

Tebennophorus Carolinensis.

the whole body. Locomotive disk expanded at its margin, and visible beyond the sides of the mantle; no median band. Respiratory orifice near the head. Anal orifice contiguous to, and a little above and in advance of, the pulmonary orifice. Orifice of organs of generation behind and below the eye-peduncle. Without terminal mucus-pore.

Jaw horn colored, arcuate, with a slightly denticulated or irregular concave margin, bearing a blunt slightly projecting beak; terminations blunt; the anterior face is convex, without a decided median carina, and strongly striate.

The lingual membrane is very broad, composed of teeth of a short, conical form, the central symmetrical and smaller, the laterals inclined towards the central, apex of each sharp; or as in *T. dorsalis*, the centrals tricuspid, laterals bicuspid, uncini serrated.

The internal rudimentary, nail-like shell described by Dr. Gray has not been noticed by any American author.

The habits of the genus are similar to those of the native species of *Limax*.

This genus was first described in 1842 by Binney (Bost. Journ. Nat. Hist. iv. 163), under the name of *Tebennophorus*. No other descriptions of it have been published. The three species of it have been referred by various authors to other genera, such as *Limax*, which differs in having a small, shield-like mantle, a different shaped jaw, &c., and to *Philomycus*, a genus distinguished by the absence of a mantle. The latter genus probably existed only in the fertile

imagination of Rafinesque, the same "habitat" where flourished *Tremesia* and *Deroceras*.*

Férussac repeats (1823) the description of Rafinesque, but never had seen an individual of the genus. He suggests that *Limax Caroliniensis*, Bosc, may belong to it, judging from the figure alone. Gray, H. and A. Adams, and Mörch adopt the name of *Philomycus*, on the supposition that Rafinesque had before him a *Tebennophorus* when describing *Philomycus* (in 1820). It may be he had, but as he did not make it so appear I have preferred adopting the first name evidently applying to it.

Tebennophorus Carolinensis.

Body elongated, sub-cylindrical, posterior extremity obtuse; mantle fleshy, covering the whole body; foot extending a little beyond the mantle posteriorly.

Limax Carolinensis, Bosc, Vers de Buffon, de Deterville, 80, pl. 3, fig. — Férussac, Hist. 77, pl. 6, fig. 3. — Deshayes, in Lamarck, 2d ed. vi. 719; 3d ed. iii. 264 (1839). — Mrs. Gray, Fig. Moll. An.

Limax Carolinianus, De Roissy, Buffon de ———, v. 185 (An xiii.).

Limax togata, Gould, Inv. 3 (1841).

Philomycus Carolinensis, Férussac, Tab Syst. 15. — Pfeiffer, Brit. Mus. Cat. 158 — H. and A. Adams, Gen. ii. 220. — Chemn. Man. de Conch. i. 469, fig. 3479 (1859).

Tebennophorus Carolinensis, Binney, Bost. Journ. Nat. Hist. iv. 171 (1842); Terr. Moll. ii. 20, pl. 63, figs. 1, 2. — Adams, Vermont Moll. 163 (1842). — De Kay, N. Y. Moll. 24, pl. 3, fig. 1 (1843). — Wyman, Bost. Journ. Nat. Hist. iv. 410, anat. pl. 22 (1844). — Leidy, Terr. Moll. U. S. i. 250, pl. 3 (1851), anat. — W. G. Binney, Terr. Moll. iv. 30. — Morse, Journ. Portl. Soc. i. 7, fig. 3; pl. 3, fig. 4 (1864).

Limax marmoratus, De Kay, Cat. N. Y. An. 31, no descr. (1839). — Linsley, Shells of Connecticut, Sillim. Journ. [1] xlviii. 279, no descr.

Color of upper surface whitish, or yellowish-white, variegated with clouds and spots of brownish and blackish, so arranged as to form three ill-defined longitudinal bands, one on the centre of the back, and one on each flank, extending from the head to the posterior extremity, anastomosing more or less with each other, and having smaller spots of the same color between them; inferior margin white, or yellowish; foot whitish. Mouth surrounded with a circular row of papillæ. Body elongated, sub-cylindrical, flattened towards its posterior extremity, which is obtuse; eye-peduncles one fourth of an inch long, brownish or blackish, stout, terminating in

* See descriptions of these singular animals in the new edition of Rafinesque's "Complete Conchological Writings," Bailliere, New York, 1864. See also "Terr. Moll." i. 51, 52. — W. G. B.

a bulb; ocular points on the superior part of the bulb; tentacles immediately below the eye-peduncles, white, very short, nearly conical. Mantle fleshy, covering the whole body, its anterior edge tinged with brownish, and falling in a slight curve between the two eye-peduncles, reaching on the sides to the margin of the foot; pos-

Fig. 716.

T. Carolinensis.

terior extremity rounded; cuticle covered with irregular vermiform glands, anastomosing with each other, and having a general tendency to a longitudinal direction, with shallow furrows between, lubricated with a watery mucus, and susceptible of contractions which produce a slow, undulatory motion, like the flowing of water, over the whole surface. Foot whitish, extending a little beyond the mantle posteriorly, showing a whitish, flattened border. Orifice of the organs of generation on the right side, at a little distance behind and below the eye-peduncles. Respiratory orifice large, on the right side, one fourth of an inch behind the origin of the eye-peduncle; anal orifice in close contact, a little above and in front of it; above the respiratory orifice, on the back, is a deep curved furrow, running upwards and backwards. Locomotive band not distinguished from the lower surface of the foot. Greatest length, when fully extended, one hundred mill.; ordinary length, seventy-five millimetres.

From Canada to Texas.

In this species the head never projects beyond the mantle. The tentacles and eye-peduncles are contractile and retractile, as in the other slugs. When handled it secretes from the skin a thick, milky, adhesive mucus. Small individuals suspend themselves by a thread. We have noticed its posterior extremity curved upwards when the animal was in motion; at other times flattened and expanded, and again very much corrugated, and apparently truncated; sometimes there *appear* to be one or more mucous glands at this part, and the secretion of mucus from it is more plentiful than from other parts of the body. The mantle is not cleft from the respiratory foramen to the margin, as in most of the slugs, but is

provided with a deep furrow or canal running from the orifice to the edge of the mantle below it.

It is very inactive and sluggish in all its motions. It inhabits forests, under the bark, and in the interior of the decayed trunks of fallen trees, among which it is particularly partial to the basswood, *Tilia Americana*.

The variations from the common coloring are numerous. We have already observed the following varieties: —

a. Whitish, without clouded spots, tending to grayish.

b. Whitish, slightly clouded longitudinally.

c. Irregularly clouded with brownish, without any tendency to longitudinal arrangement.

d. With three distinct rows of large clouded spots.

e. With great numbers of fine black spots.

f. Gray, with a line of minute black dots along each side.

g. Blackish-gray, with black lines along each side, and an indistinct line down the middle of the back.

The appearance of the surface of the mantle is constantly changing, from the play of light on its lubricated eye-peduncles, tentacles, and furrows, which are in almost ceaseless motion.

There can be no doubt that this is the animal originally described by Bose under the name of *Limax Carolinensis*, though his description is so imperfect that it can only be recognized by the arrangement of colors which belongs to it. His original drawing, engraved in Férussac's work, is a tolerably accurate representation of one of its varieties. He makes no mention of the mantle, and it does not appear in the figure.

An individual of this species kept in confinement, deposited about thirty eggs, June 20, 1843; on the 10th July the young made their way out of the shell. The eggs were semi-transparent, oval, about one fifth of an inch in the greatest diameter. The young when excluded were more than a fourth of an inch long, semi-transparent and gelatinous; eye-peduncles and tentacles bluish-black at base, black at tip, the latter very minute and hardly visible. Body broad; back whitish, with two distinct rows of minute black dots down the middle, and other scattering spots on the sides. No perceptible furrow between the mantle and body. They increased very rapidly in size, and in a few days were four times as large as when hatched.

Jaw short, broad, arched, light horn colored, anterior surface convex, but having no distinct vertical carina on the centre, its most anterior point. Concave margin irregular, without a distinct, acute

median projection, though sometimes bluntly prominent. Extremities attenuated. The whole anterior surface covered with converging vertical striæ and arched striæ.

Lingual membrane with one hundred and fifteen rows of one hundred and thirteen teeth each (56 – 1 – 56); centrals conical, surmounted by a sharper point; laterals of the same shape, but narrower, becoming modified into bicuspid and papillæ-like uncini.

Of the synonymes I have quoted, *Limax togata* is said by Gould (Otia, 182) to be identical; and *Limax marmoratus* of De Kay I have ascertained to be the same from the correspondence of my father with Dr. Newcomb.

Tebennophorus dorsalis.

Body cylindrical and narrow, terminating posteriorly in an acute point; mantle closely connected with the body; base of foot very narrow, its separation from the body not well defined.

Philomycus dorsalis, BINNEY, Bost. Journ. Nat. Hist. iv. 174 (1842); Proc. Bost. Soc. N. H. 1841, 52. — ADAMS, Vermont Moll. 163 (1842). — GRAY and PFEIFFER, Brit. Mus. Cat. 159.

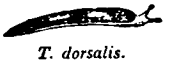
Limax dorsalis, DE KAY, N. Y. Moll. 22 (1843).

Tebennophorus dorsalis, BINNEY, Terr. Moll. ii. 24, pl. 63, fig. 3 (1851). — W. G. BINNEY, Terr. Moll. iv. 31.

Pallifera dorsalis, MORSE, Journ. Portl. Soc. i. 8, fig. 5; pl. 3, fig. 6 (1864).

Color of upper surface ashy, with a shade of blue, an interrupted black line extending down the centre of the back; eye-peduncles black, about one eighth of the length of the body; tentacles blackish, very short. Body cylindrical and narrow, terminating posteriorly in an acute point; base of foot white, very narrow, its separation from the body not well defined. Upper surface covered with elongated and slightly prominent glandular projections, the furrows between indistinct. Respiratory orifice very minute, situated on the right side, about one eighth of an inch behind the insertion of the eye-peduncle. The mantle is closely connected with the body. Length, eighteen millimetres.

Fig. 717.



T. dorsalis.

Vermont and Massachusetts.

This animal is found in woods and forests, in the soil under decaying trunks and logs. It is lubricated by a watery mucus, which is not secreted in quantity sufficient to preserve its life when removed from its native haunts and exposed to the air. It is even difficult to preserve it long enough for examination, as it becomes

dry, diminishes in bulk more than one half, and dies. We have seen but three specimens. They were very active in their movements, and one of them suspended itself by a thread of mucus, in the manner of the *Limaces*. Our specimens were found in Vermont. Dr. Gould has recognized this or a similar species near Boston.

It is quite possible that this is one of the species described by Rafinesque, but from the poverty of his descriptions we are unable to identify it with either of them.

When Dr. Binney for the first time procured this animal, not being able to distinguish the separation of the margin of the mantle from the edge of the foot, he felt assured that it must be a species of Rafinesque's genus *Philomycus*, and he accordingly described it as such. Having an opportunity since that time of examining several of them, he noticed, on throwing some of them into alcohol for preservation, that the contraction caused by the liquor revealed and detached the mantle from its adhesion. Its characters, therefore, correspond with those of the present genus. It is by no means certain, however, that it may not prove to be the young of the preceding species.

Since the above was written Morse has published (Journ. Portl. Soc. i. 8) a figure of the jaw and lingual membrane of this species which he believes to differ sufficiently from those of *T. Carolinensis* to warrant its generic distinction. I have hesitated to adopt his name *Pallifera* until his observations shall be confirmed by others.* He describes the jaw as arcuate, ends rounded, blunt, anterior surface with stout costæ, strongly denticulating the concave margin. The lingual membrane he describes as composed of one hundred and fifteen rows of one hundred and thirteen teeth each (56-1-56); centrals tricuspid, laterals bicuspid, uncini with three or four cusps or serrate.

Order LIMNOPHILA.

Eyes sessile; tentacles sub-cylindrical or flattened, simply contractile. Operculum wanting. Animal usually lacustrine or fluviatile, sometimes marine or littoral, rarely terrestrial.

All the known families of *Limnophila* are represented in this country. Their habits are described under each.

* The more so as he figures the jaw and tongue of an *Arion* for those of *Limax agrestis*. I have detected errors of my own of this kind, arising from incorrectly labelling extracted jaws and tongues. — W. G. B.

Family AURICULIDÆ.

Lingual membrane broad and elongated; teeth numerous, in slightly bent, cross series; central tooth equilateral; lateral teeth rather inequilateral, diminishing in size towards the outer edge. Head ending in a snout; mouth with a horny lunate upper jaw, and with two dilated buccal lobes, united above, separated below; tentacles sub-cylindrical, contractile; eyes sessile at the inner sides of the bases. Mantle closed, with a thickened margin; foot long, posteriorly blunt; respiratory orifice posterior, on the right side, excretory orifice near it. Sexes united, orifices of generative organs distant, on the right side.

Shell spiral, covered with a horny epidermis; aperture elongate, with strong folds on the inner lip; outer lip often dentate.

Animal usually frequenting salt marshes.

The *Auriculidæ* are easily distinguished from the other inoperculated air-breathing Mollusks. They are furnished with but one pair of non-retractile tentacles, on the inner base of which are situated the sessile eyes. The head is extended beyond the tentacles into an obtuse, rounded, bilobed snout. The mantle is thin, thickened on its margin. The foot is elongated and pointed. The sexes are united in each individual.

The shell is spiral, extremely variable, and in the American species conic, generally with a flattened spire, and furnished with numerous tooth-like laminæ, which contract the narrow aperture. The internal septa are usually removed.

The *Auriculidæ* are amphibious Mollusks, breathing free air, but apparently dependent for existence on a great deal of moisture, if not on the actual vicinity of the sea. Some species pass their whole life under circumstances which seem to preclude the possibility of their respiring air. Thus *Alexia myosotis* is often found on isolated stones in salt marshes, which are entirely covered by the tide four hours out of twelve. This species, when immersed in fresh water, becomes benumbed and soon dies.

Carychium exiguum, on the other hand, though found under similar circumstances, does not depend on the proximity to salt water, being widely distributed far beyond its influence over the interior of the country. *Blauneria pellucida*, also, has been detected living

far from any water in a garden in the District of Columbia, whither it was introduced on plants from Charleston, S. C. With the exception of the two last mentioned, the American species are found on salt marshes and in brackish water near the sea.

Of the geographical distribution of our species but little is yet known. *Melampus bidentatus* is found from Maine to Texas.

Genus ALEXIA, (Leach,) Gray. 1847.

Fig. 718.

Animal of *A. myosotis*. Enlarged.

Foot simple beneath, without a transverse groove.

Jaw narrow, slightly arcuate, extremities but little attenuated, striæ obsolete, scarcely any median projection.

Shell oblong-ovate, thin, spire pointed; last whorl large, rounded at base; aperture rather broad, oval, acuminating; parietal wall furnished with from one to five tuberculous laminæ; columellar fold oblique; peristome expanded, armed with teeth, or thickened within.

But one species is known to inhabit North America. Most of the few foreign species inhabit the coasts of the Mediterranean, though the genus is represented in South America and the West Indies.

Alexia myosotis.

Fig. 129.

Shell ovate-conical, smooth, reddish horn-color; spire elevated and pointed; inner lip with three teeth; lip reflexed.

Auricula myosotis, Draparnaud, &c.

Auricula denticulata, Gould, Inv. of Mass. 199, fig. 129 (excl. *Voluta denticulata*, Mont. et syn. suis.) (1841), not of Montfort. — De Kay, N. Y. Moll. 58, pl. 5, figs. 91, 93 (excl. *Voluta denticulata*, Mont. et syn.), nec Montfort.

Melampus borealis, Conrad, Am. Journ. Sc. [1], xxiii. 345 (1833).

Alexia myosotis, Pfeiffer, Mon. Auric. Viv. 148; Brit. Mus. Auric. 114. — W. G. Binney, Terr. Moll. iv. 172, pl. 75, fig. 33; pl. 79, fig. 16; L. and Fr. W. Shells, iii. 4, fig. 4 (1865).

Carychium (Phytia) myosotis, Moquin-Tandon, Moll. Fr. ii. 417, pl. 29, figs. 33–39; pl. 30, figs. 1–4.

Conovulus myosotis, Reeve, Br. L. and Fr. W. Shells, 130 (1864).

Shell of an elongated oval form, slightly opaque, shining, horn color, often tinted with reddish or violet; lines of growth very faint; spire elevated and pointed, composed of seven or eight slightly convex whorls, separated by a well-defined suture, which often has a

marginal line revolving near it; the lowest whorl much larger than all the others together; aperture ovate, broadest below; outer lip thin and sharp, reflexed and white, joining the preceding whorl by a very acute angle; on the inner lip the adult shell has three white folds or teeth; the lower one formed by the turning of the lip within the aperture; the second tooth-like and nearly transverse, thin and prominent, a little below the middle of the inner margin; and a third, minute one, a little above; the lower portion of the left margin expands a little, and conceals a very minute umbilicus; two or three teeth are also sometimes found within the outer lip. Length, three tenths of an inch; breadth, five fortieths of an inch; divergence, thirty-five degrees.

Fig. 719.

A myosotis. Enlarged.

Found in the crevices of decaying wooden wharves, about and below high-water mark, in shaded situations. From Nova Scotia to Rhode Island. It is an European species, inhabiting England, France, Spain, &c.

Animal very light drab color, head and tentacula darker and wrinkled; tentacula about one tenth of an inch in length, globose at tip, the eyes kidney-shaped, and seated on a slight enlargement at the inner base of the tentacula; foot about half the length and width of the shell, rounded behind, two-lobed in front, and transversely divided at the anterior third. Respiratory orifice far back, on the right side.

This little shell is very readily distinguished from any other found on our coast, and seems to be another of the connecting links between the land and water shells, or rather between those which breathe air and those which breathe water. It has, accordingly, been frequently transferred from one genus to another, according to the conjectures of different writers. Guilding placed it rather doubtfully, after a series of experiments as to the nature of its respiration. Its habits certainly associate it with the *Melampus bidentatus*. It is widely distributed over the seas, and is doubtless conveyed to great distances on floating pieces of decaying timber.

It varies much in its characters according to its age. Its color varies from light horn color to deep violet, and sometimes it becomes opaque-white. There is usually a single revolving line of rigid hairs just before the suture. When young, it is proportionally broader, and the lower whorl proportionally longer, has but two teeth, and the margin of the lip is not reflexed. A third, and sometimes a fourth, tooth appears at maturity, and also some teeth or tubercles within the right lip. This is, indeed, made a part of its

character by European writers; but, of several specimens sent me by Mr. Sowerby, only one had them. In fact, it must be very doubtful whether the species described under the names of *bidentata*, *triplicata*, *pusillus*, *alba*, *ringens*, *reflexa*, and perhaps *Firmini*, are anything more than modifications by age, accident, and locality, of this same species.

[I have placed this shell in this genus on the authority of Pfeiffer and of Adams's Genera. It has been placed in many different genera by European authors. In America it has been considered an *Auricula* by Gould and others, until Stimpson classed it among the *Melampi*. From the exterior of the animal there appears no difference between it and *Melampus bidentatus*. It does not even agree with the animal of *Alexia*, given by Adams in the "Genera of Recent Mollusca," which I have copied on pl. 75, fig. 22, of "The Terrestrial Mollusks." This figure represents the true *Alexia denticulata*, Montfort, with which Gould confounds this species. The shell is also quite distinct. It is, however, united to *Alexia myosotis*, by Forbes and Hanley, in their work on "British Mollusca," and by Moquin-Tandon. Pfeiffer considers them distinct, as does also Reeve.

It is probably an imported species, as Stimpson remarks ("Shells of New England"), being found only in the Atlantic seaports. At Boston it is common on old wooden wharves in the harbor. It is also found on isolated stones which are immersed by the rising tide at least four hours out of the twelve. When placed in fresh water it becomes benumbed and dies; it will live without water in captivity several days.

Genus CARYCHIUM, Müller. 1774.

Foot not transversely divided beneath.

Shell pupa-shaped, very thin, transparent, with but few whorls; aperture sub-oval, with one dentiform columellar fold, sometimes obsolete; parietal wall with one or two teeth; peristome expanded, terminations not approximating, the right hand one with one internal tooth.

Jaw slightly arched, without ribs or marginal denticulations, hardly striated towards the margin.

Teeth in slightly bent cross series, central equilateral, narrow, laterals broad, short, denticulated.

But very few species of this genus have been described, most of which are from Europe. Animal terrestrial.

Carychium exiguum.

FIG. 122.

Shell minute, whitish, oblong-ovate, rather pointed; whorls five; the transverse lip very oblique, with a small fold near its internal angle; outer lip widely reflexed.

Pupa exigua, SAY, Journ. Acad. ii. 375 (1822); ed. BINNEY, 26. — GOULD, Bost. Journ. iii. 398, pl. 3, fig. 20 (1841); iv. 358 (1843); Inv. 191, fig. 122 (1841). — DE KAY, New York Fauna, 49, pl. 4, fig. 46 (1843). — ADAMS, Vermont Moll. 158, figure (1842).

Bulimus exiguus, BINNEY, Terr. Moll. ii. 286, pl. 53, fig. 1.

Carychium exiguum, GOULD, in Terr. Moll. ii. 286. — CHEMNITZ, 2d ed. 61, pl. 1, figs. 13, 14. — PFEIFFER, Mon. Auric. 165; Brit. Mus. Auric. 127; Wiegm. Arch. 1841, i. 224. — W. G. BINNEY, Terr. Moll. iv. 178. — FRAUENFELD (1847), Akad. der Wiss. xix. 79; Zool. Bot. Wien. iv. 10, pl. 1, fig. 1 (1854). — BOURGUIGNAT, Mag. Zool. 1857, 209. — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 6, figs. 7, 8 (1865).

Carychium exile, H. C. LEA, Am. Journ. Sc. [1], xlii. 109, pl. 1, fig. 5 (1841). — TROSCHEL, Ar. f. Nat. ii. 128 (1843).

Carychium existelium, BOURGUIGNAT, l. c. 220.

Carychium euphœum, BOURGUIGNAT, l. c. 221.

Shell elongated, pellucid, tapering somewhat to both ends, apex not very blunt; color watery-white; whorls five, rather convex, very oblique; suture very distinct; aperture obliquely oval; transverse lip very oblique, and having near its inner termination a small, tooth-like fold; another very small, tubercular tooth is found at the middle of the pillar; outer lip white, widely reflected, but not flattened. Length, one fifteenth of an inch; breadth, one fortieth of an inch.

Fig. 720.

C. exiguum.

Has been found in the New England, Northern, and Middle States, in South Carolina, Arkansas, and Texas.

Animal colorless; tentacles stout, hyaline, one third the length of the foot. The foot is short, thick, distinctly divided into two segments, the anterior of which is bilobed, and projects, when the animal is in motion, considerably in advance of the head. Eyes oval, situated on the back, near the base of the tentacles. Its motions are very sluggish. It carries the shell directed horizontally; the shell is so transparent that the viscera of the animal may be seen through it.

It has been said to resemble *Carychium minimum*, of Müller, but

neither the figure nor description, as given by Draparnaud, corresponds with our shell.

It is found under stones and fragments of wood, and especially among moss in damp places. It is the only species of this family inhabiting the interior, but though found over a wide extent of country, it still possesses a fondness for the sea in common with the other species of the family. Around Boston it is found at or below the surface in swamps, growing among mosses.

This minute shell is well known in American cabinets as a *Pupa*. Say described it as such in 1822, though he mentions the probability of its being a *Carychium*. It has been described since that time as a *Pupa* by Gould, De Kay, and Adams, and catalogued among the species of the same genus by all the American writers who have mentioned it, until 1851, when its correct position was pointed out by Stimpson ("Shells of New England"), and Gould ("Terr. Moll." ii.). The former places it in his family of *Melampidæ*.

Dr. Binney, in 1843 ("Boston Journal," p. 106), considers it a *Pupa*. In the "Terrestrial Mollusks" he places it under *Bulimus*.

In 1852, Jay removed it from *Pupa* to *Carychium* (Cat. p. 263).

Notwithstanding its distinct generic peculiarities having been pointed out in 1851, we find the shell considered as a *Pupa* in several American catalogues as late even as 1857 (*vide* "Boston Proc." vi. 128).

In Europe we find its true position pointed out by Pfeiffer as early as 1841, and by all subsequent writers.

Genus MELAMPUS, Montfort. 1810.

Foot bifid posteriorly. Shell ovate-conical; spire short, obtuse; aperture narrow, linear; inner lip with several transverse folds; outer lip acute, internally plicate.

Jaw — ?

Lingual membrane — ?

Melampus bidentatus.

Fig. 130.

Shell ovate-conical, gray or brownish horn color; spire short and obtuse; aperture narrow, two folds on the pillar.

Melampus bidentatus, SAY, Journ. Acad. Nat. Sc. Phila. ii. 245 (1822), BINNEY's ed. 84. — RUSSELL, Journ. Essex Co. Nat. Hist. Soc. i. part 2, 67 (1839). — PFEIFFER, Mon. Auric. Viv. 45 (excl. *Mel. borealis*). — W. G. BINNEY, Terr. Moll. iv. 156, pl. 75, fig. 23; Smith Inst. L. and Fr. W. Shells, ii. 10, figs. 11, 12 (1865).
Melampus biplicatus, PFEIFFER, Mon. Auric. Viv. 21; Br. Mus. 14.
Melampus Jaumei, PFEIFFER, Mon. Auric. Viv. 25; Brit. Mus. Cat 18.
Auricula cornea, DESHAYES, Ency. Méth. ii. 90 (1830); in LAM. 2d ed. viii. 339, 3d ed iii. 390 (1839).
Auricula bidentata, GOULD, Inv. Mass 197, fig. 131 (1841). — DE KAY, N. Y Moll 57, t. 5, figs. 92, 1, 2, 3 (1843). — KÜSTER, Chemn. 2d ed. Auric. 41, pl. 6, figs. 7–11.
Auricula Jaumei, MITTRE, Rev. Zool. (Mars, 1841), 66.
Auricula biplicata, DESHAYES, Encyc. Méth. ii. 91.
Melampus bidentatus, var. *lineatus*, SAY, p. 46 of ed. BINNEY.
Melampus bidentatus, β, PFEIFFER, Mon. Auric. 46. — Var a. DE KAY, l. c.
Not *Auricula bidens*, POTIEZ et MICHAUD, Gal. 201, pl. 20, figs. 9, 10.

Shell ovate-conical, broadest at about the upper third, where there is a faint angle, thin, translucent, of a brownish horn color, smooth and shining, often becoming eroded, wrinkled lengthwise, with occasional broken revolving lines, very minute; whorls five or six, the lower one three fourths the length of the shell, the others, separated by a distinct suture, and flattened, form a short, blunt spire; aperture long and narrow, broadest below; outer lip thin and sharp, the posterior third suddenly bending inwards joins the body of the shell by a very acute angle; the inner lip, usually covered with enamel, has two folds upon it, a transverse one below the middle, and another formed by the outer lip as it rises and turns within the shell; this portion is usually white; within the outer lip are occasionally to be found from one to four elevated, white, revolving ridges, not reaching the edge of the lip. Length, half an inch; breadth, three tenths of an inch; divergence, sixty-eight degrees.

Fig. 721.

M. bidentatus.

From New England to Texas. Inhabits marshes that are occasionally overflowed by the tide, and never far below high-water mark. They frequently crawl up the stems of grasses at the margins of inlets, apparently to escape the rising tide. In October, 1839, I observed great numbers of them at Oak Island, a small, wooded upland spot in Chelsea surrounded by salt marsh. They were burying themselves under the leaves, and in the loose earth at the base of rotten stumps. This spot is now never overflowed by the tide.

The animal is reddish-brown above, paler beneath, foot about the length and breadth of the shell, broad before, and bluntly pointed behind, the margins somewhat scalloped, or undulated, and divided

across at about the anterior third; tentacula slender and tapering, the eyes at the inside of the base; rostrum nearly as long as the tentacula, with an expanded lobe each side.

The perfect shells are smooth and brown, with usually three or four darker, narrow bands; but the shells soon become eroded, and the surface is left rough, and of a grayish color. The ridges within the outer lip are not seen except in aged shells.

Say designates by the name of *lineatus* a form peculiar for its revolving lines or bands and more narrow base of the aperture (*vide* Binn. ed. p. 85). I have met with none sufficiently marked to form a variety, much less a distinct species. The revolving lines are commonly found on young specimens. De Kay mentions this as var. α, Pfeiffer as β.

Stimpson gives precedence to Deshayes's name *corneus*. Say's name has eight years' priority, and is not preoccupied in the genus *Melampus*. It was while treated as an *Auricula* that any question existed in regard to its specific name.

Family LIMNÆIDÆ.

Lingual membrane armed with numerous, quadrate teeth, arranged in transverse rows, the central minute, the laterals uncinated or simply denticulated. Head with a broad, short muzzle, dilated at the end; mouth with one or more jaws; tentacles contractile, flattened or subulate, with the eyes sessile at their inner bases. Mantle margin variously modified; respiratory orifice at the right side. Foot flattened, lanceolate or ovate. Excretory orifices on the left side of the neck. Sexes united; male and female organs with separate orifices, on the right or left side.

Shell of a varied form, thin, horn colored, usually with an oblique fold on the columella, and with the outer lip simple and acute.

Animal living in fresh water, usually coming to the surface to respire the free air.

The *Limnæidæ* are found in every quarter of the globe; but in North America most of the genera are represented, excepting *Chilina*, *Camptoceras*, *Amphipeplea*, *Latia*, &c. They are more plenty in species and individuals in the more temperate portions of the continent. Especially among the innumerable lakes of the British possessions do the large species flourish.

They are strictly aquatic in their habits, abounding in the small quiet streams and stagnant ponds, feeding exclusively on vegetable substances. They usually come to the surface to breathe the free air, but their organs of respiration must be adapted, in some species at least, to breathing through the medium of water, as they are occasionally found in circumstances precluding any possibility of an approach to the surface.

Their eggs are laid in clusters, surrounded by a gelatinous matter.

Many of the species possess the power of gliding along the surface of the water, shell downwards, and letting themselves down by means of a gelatinous thread.

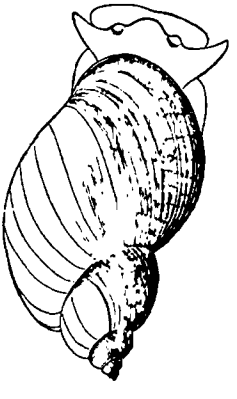
From the fact of my finding young individuals only in the spring, and numerous dead full-grown shells during the late autumn and winter, I presume they arrive at maturity in one season. They are active during the spring, summer, and autumn, but bury themselves in the mud during winter, at least in the Northern States.

The *Limnæidæ* have been grouped by some authors according to the number of their horny jaws, but in the present stage of knowledge of them it seems to me preferable to adopt that division into sub-families based upon the form of the shell, which is found to be spiral and elongate, spiral and flattened, or non-spiral and simply patelliform.

The shells of some of the various genera present considerable difference in form, but their characters are not as well marked or reliable as in the *Helicidæ*.

Genus LIMNÆA, Lamarck. 1799.

Fig. 722.



Animal of *L. megasoma*.

Tentacles flattened and triangular. Mantle with the front edge thickened. Foot short, rounded. Shell dextral, spiral, oblong, translucent, horn colored; spire acute, more or less produced, last whorl ventricose; aperture large, wide, rounded in front; inner lip with an oblique fold; outer lip simple.

Jaws three, smooth; one upper, large, transversely oblong or ovate; two lateral, rudimentary, narrow, convex.

Lingual membrane (of *L. columella*) broad, teeth crowded, numerous; central narrow,

long, apex attenuated, recurved; laterals broad, blunt, apex recurved, denticulated.

This genus is found over almost the whole world, but prefers the more temperate portions of it. In North America, likewise, it is found in greater abundance and perfection in the lake region of the United States, and still more so in the British possessions. In the States bordering on the Gulf, and in Mexico, it is hardly represented.

Limnæa columella.

FIG. 144.

Shell ovate, fragile, transparent, pale-green; whorls four, the three upper ones minute, lines of growth distinct, undulated by revolving lines; aperture ample; umbilicus minute.

Limnæa columella, SAY, Journ. Acad. Nat. Sc. Phila. i. 14 (1817); ii. 167 (1821); Nich. Encyc. 3d ed. (1819); BINNEY'S ed. 60, 56. — HALDEMAN, Mon. 38, pl. 12 (1842). — GOULD, Inv. of Mass. 215, figs. 144, 216, fig. 145 (1841). — DE KAY, N. Y. Moll. 72, pl. 4, fig. 75 (1843). — POTIEZ et MICHAUD, Gal. i. 216, pl. 22, figs. 5, 6. — ANON. Can. Natural. ii. 197, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 32, figs. 38–44 (1865).

Limneus columella, KÜSTER, in CHEMN. 2d ed. 44, pl. 8, figs. 3–5.

Limnæa chalybea, GOULD, Am. Journ. Sc. [1], xxxviii. 196 (1840); Otia, 180.

Limnæa macrostoma, SAY, Journ. Acad. Nat. Sc. ii. 170 (1821); BINNEY'S ed. 67. — GOULD, Inv. 217, fig. 148 (1841). — ANON. Can. Nat. ii. 198, fig. (1857).

Limneus macrostomus, KÜSTER, in CHEMN. 2d ed. 43, pl. 8, figs. 1, 2.

Limnæa acuminata, ADAMS, Am. Journ. Sc. [1], xxxix. 374 (1840).

Limnæa navicula, VALENCIENNES, Rec. d'Obs. ii. 251 (1833).

Limnæa strigosa, LEA, Proc. Am. Phil. Soc. ii. 33 (1841); Trans. ix. 12 (1844); Obs. iv. 12.

Limnæa coarctata, LEA, Proc. Am. Phil. Soc. ii. 33 (1841); Trans. ix. 11 (1844); Obs. iv. 11.

Limnæa casta, LEA, Proc. Am. Phil. Soc. ii. 33 (1841); Trans. ix. 11 (1844); Obs. iv. 11.

Limnæa columellaris, ADAMS, Sillim. Journ. [1], xxxvi. 392, absq. descr.

Limnæa succiniformis, ADAMS, MS. teste HALDEMAN.

Fig. 723.

L. columella.

Shell ovate, ventricose, extremely thin and fragile, transparent, of a pale greenish or yellowish color, the apex acutely pointed; whorls four, of which the last is much inflated, and composes nearly the whole shell; the upper ones are very small, forming an acute apex; surface with conspicuous and nearly regular lines of growth, minutely waved by revolving lines, some of which are distinctly elevated; suture slightly impressed; aperture large, four fifths the length of the shell, generally somewhat dilated; lip very sharp, ending with a small curve behind; on the

left margin the edge is slightly turned over a minute umbilicus, and forms a considerable fold; a thin, closely adhering enamel stretches across from it to the angle of the aperture; the inner lip is so arched as to display a considerable portion of the interior of the shell. Length, eight tenths of an inch; breadth, five tenths of an inch; divergence, sixty-eight degrees. Of another specimen, length, thirteen twentieths of an inch; breadth, four tenths of an inch; divergence, fifty-six degrees.

Inhabits stagnant pools and miry places, and is common. It is found at maturity very early in the spring.

The species has been found from Canada and Nova Scotia and Lake Superior to Georgia. Its wide range and variable form has caused its being described under several names.

The animal is large, semi-transparent, of a dusky or light drab color, dotted with silvery white. It is very sluggish in its motions. The head above is slightly tinted with lilac.

This very brittle shell has rather the aspect of *Succinea* than of *Limnæa*. It varies a good deal in form, being in some specimens rather slender, and in others broad and distended. The aperture is usually somewhat dilated, especially at its broadly-rounded base; but occasionally the outer lip is pressed inwards. The surface is shining, and delicately corrugated by revolving lines.

Var. CHALYBEA.

Fig. 145.

The spire is more pointed, its divergence being only fifty degrees; the aperture is more expanded, and the fold on the inner lip more obvious. It is thin, but not very brittle, ringing like hard-burnt crockery. The last whorl is partially detached from the preceding one, so as to form a thread-like channel at the suture. The enamel rests loosely against the shell and is wrinkled. The exterior is covered by a bluish-black pigment, not easily removed, and the interior has a steel-blue or black-lead color.

This shell, which I found two years in succession in a muddy pool in Cambridge, I thought was sufficiently distinct to be regarded as a new species; and I accordingly gave its characters, under the name of *Limnæa chalybea*, in "Silliman's Journal," xxxiii. 196. But as it has not been found in any other place, I am now disposed to regard it as a strongly marked local variety of *L. columella*. It is very possibly such a shell to which Mr. Say alludes in the "Jour-

nal of the Academy of Natural Sciences," ii. 167, as "*L. columella*, var. a. small, black, from Cold Water Creek, Missouri."

The form called *Limnæa macrostoma* is thus described in the first edition. Fig. 148: —

Shell fragile, pellucid, light horn colored, ovate-conical; last whorl very large, moderately inflated, surmounted by three very small, oblique ones, forming an acute apex; surface shining, marked by fine lines of growth, which are crossed and rendered flexuous by numerous revolving lines, faintly visible without a magnifier; suture distinct, the whorls approaching it by a gradual slope; aperture ovate, very ample, four fifths the length of the shell, and, when mature, broadly expanded; outer lip very sharp and thin, broadly rounded in front, and maintaining its sharp edge, it rises and disappears within the shell; pillar so broadly arched as to allow a view of much of the interior of the spire; a minute umbilicus is formed by a reflected scale of enamel; in mature shells a glazing of enamel is found upon the preceding whorl as it encroaches upon the aperture. Length, eleven twentieths of an inch; breadth, seven twentieths of an inch; divergence, seventy-three degrees.

Fig. 724.

L. macrostoma.

Found at New Bedford by Mr. Shiverick. Much larger specimens were obtained by Colonel Totten, at Tiverton, Rhode Island. Dr. Binney found it also in Vermont.

This shell is closely allied to *L. columella*, and in an immature state is not easily distinguished from it; but that shell is much more elongated, and regularly tapering, the divergence of the spire being not more than sixty degrees. Such specimens Professor Adams described as his *L. acuminata*. But at maturity the shell is very distinctly characterized by its widely spreading outer lip, which gives great expansion to the aperture. Mr. Say received it from the rice-fields of Carolina. It is the analogue of the *L. ovata* of Europe.

Limnæa decollata.

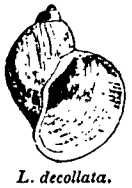
Shell ventricose, rather thick, olivaceous-green color; whorls two to three, body whorl composes almost the whole shell; aperture very large, sub-campanulate; columella-fold very prominent.

Limnæa decollata, Mighels, Proc. Bost. Soc. i. 49 (1841); Bost. Journ. iv. 4–5, 336, pl. 4, fig. 13 (and Adams) (1842). — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 31, figs. 36, 37 (1865).

Limnæus catascopium, HALDEMAN, part, Mon. 52, pl. 14, figs. 1–3 (1842).
Limnæus decollatus, KUSTER, in CHEMN. 2d ed. 45, pl. 8, figs. 11–14.

Shell very ventricose, rather thick, sub-ovate or sub-rotund, in outline an irregular rhomboid; epidermis of an olivaceous-green color, rather thin, deciduous; whorls two to three; spire very short, generally decollated; whole surface generally rather rough; striæ of growth coarse and fine alternately; transverse striæ on the body whorl sparse, interrupted, sometimes obsolete; body whorl composes almost the whole shell; aperture very large, sub-campanulate; its length is very little greater than the breadth, and occupies more than two thirds the length of the shell; labrum rather thin, simple; fold of the columella very prominent. Length, six tenths of an inch; breadth, five tenths of an inch; height, four tenths of an inch.

Fig. 725.



L. decollata.

Animal dingy mouse-color, with a slight tinge of purple, covered with numerous microscopic, elongated white spots on every visible part of the surface, including the mouth and tentacula; foot of a chocolate color, rather broad, length rather greater than the aperture; habits sluggish. Cabinets of the Bost. Soc. N. H., Dr. Gould, S. S. Haldeman, J. G. Anthony, J. W. Mighels, and C. B. Adams.

Unity, Maine, discovered by Dr. Milliken of that town, to whom we are indebted for specimens.

This odd but interesting shell is readily recognized by its rhomboidal aspect, wide aperture, and rather rough and distorted appearance. It is allied to *L. catascopium*, Say, but is distinct from that shell by having less whorls by two, and a much shorter spire; by being wider, and its divergence greater by more than thirty degrees. By some it has been supposed to be identical with *L. emarginata*, Say. This is impossible. *L. emarginata* is much more cylindrical, the divergence of its spire is scarcely half as great as that of our shell; it is much thinner, and has at least two more volutions. Our shell is also destitute of the "deep emargination" which distinguishes *L. emarginata*. (*Mighels* and *Adams.*)

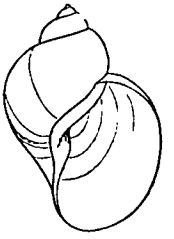
Found around Lake of the Woods, in Maine and Connecticut.

Limnæa ampla.

Shell large, inflated, sub-oval, rather thin, obscure olivaceous-green color; whorls five, convex; suture deep; aperture oblong, occupying rather more than two thirds the length of the shell; columella-fold very prominent; umbilicus open and very deep.

Limnæa ampla, MIGHELS, Bost. Journ. N. H. iv. 347, pl. 16, figs. 1, *a*, *b*, *c* (Apr. 1843); Proc. i. 129 (Oct. 1843), not of HARTMANN.* — WHITEAVES, Can. Nat. (Apr. 1863), viii. 112, fig. 11. — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 30, fig. 34 (1865).

Fig. 726.



L. ampla.

Shell large, much inflated, sub-oval, rather thin, composed of five convex whorls, prominently shouldered at the upper part; epidermis of an obscure olivaceous-green color; lines of accretion very fine and compact; transverse lines obscure, appearing serriform under a magnifier, giving the surface the appearance of very delicate lace-work; suture deep, and in one specimen sub-canaliculate; spire short and pointed when present; aperture oblong, very wide at the posterior part, but narrowing rapidly anteriorly and occupying rather more than two thirds the length of the shell; labrum thin and somewhat reflected; labium broadly reflected, forming and partially covering an open and very deep umbilicus; columella fold very prominent; within it is of a light yellowish-fawn color, with an obscure purplish zone, one line in breadth, and about two lines within the aperture. Length, one and three tenths inches; breadth, one inch; height, eight tenths of an inch. Divergence of the spire very variable.

Fig. 727.

L. ampla.

Second Eagle Lake, Maine, N. lat. 47° (*Mighels*).

Fig. 726 is a fac-simile of one of Dr. Mighels's. Fig. 727 is drawn from a specimen from Maine.

Limnæa elodes.

FIGS. 146, 147.

Shell turreted, elongated, dull horn colored; whorls five, convex; suture deep; aperture sub-oval, less than half the length of the shell, within brownish, fold of the columella profound.

Limnæus elodes, SAY, Journ. Ac. Nat. Sc. Phil. ii. 169 (1821); Am. Conch. iv. pl. 31, fig. 3 (1832); BINNEY'S ed. 66, 188, pl. 31, fig. 3; ed. CHENU, 44, pl. 8, fig. 3. — KÜSTER, in CHEMN. 2d ed. 42, pl. 7, figs. 17–21.

Limnæa elodes, GOULD, Inv. of Mass. 221, figs. 146, 147 (1841). — ADAMS, Shells of Vermont, in Thoms. Hist. 153 (1842). — ANONYMOUS, Can. Nat. ii. 199, fig. (1857).

Limnæa fragilis (not of LINNÆUS), HALDEMAN, Mon. 20, pl. 6, 15, fig. 1 (1842); 53, pl. 14, fig. 1. — DE KAY, N. Y. Moll. 68, pl. 4, fig. 68 (1843).

Limnæa palustris, MULLER (*Buccinum*), &c. — SHEPPARD (1829), Tr. Lit. Hist. Soc. Que-

* *Gulnaria ampla*, Hartmann, 1842, is referred by Reeve to *L. auricularia*. Should it prove a distinct species, our shell might be called *L. Mighelsi*.

bec, i. 196. — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 44, figs. 60 – 66 (1865).

Limnæa Nuttalliana, Lea, Pr. A. P. S. ii. 33 (1841); Tr. Am. Phil. Soc. ix. 9 (1844); Obs. ii. 9. — Küster (*Limnæus*), in Chemn. 2d ed. 38, pl. 7, fig. 5.

Limnæa plebeia Gould ? (see below.)

Limnæa expansa, Haldeman, Mon. 29, pl. 9, figs. 6 – 8 (1842); Suppl. to Part I., p. 3 (1840). — De Kay, N. Y. Moll. 75, pl. 36, fig. 348 (1843). — Küster (*Limnæus*), in Chemn. 2d ed. 39, pl. 7, figs. 6, 7.

Shell tapering, elongated, turreted, thin and fragile, dull and dingy horn colored, inelegant; whorls five or a little more, the two smallest being generally broken off; they are regularly and largely convex, not flattened or compressed posteriorly, but the adjacent margins of two whorls curve regularly to the deeply impressed suture; the last whorl, measured upon the back, constitutes from a little more than one half to about two thirds the whole length of the shell; surface coarsely wrinkled by the lines of growth, sometimes minutely reticulated by revolving lines, and sometimes exhibiting small, plain facets, irregularly disposed. Aperture generally less than, but never exceeding one half the length of the shell; sub-oval, rather contracted; right lip thin, with now and then a sub-marginal thickening, within colored reddish-brown; pillar margin copiously overlaid with white enamel, not closely appressed at the umbilical region; fold of the pillar large and oblique; umbilicus for the most part closed. Length, nine tenths of an inch; breadth, four tenths of an inch; divergence, forty-three to forty-five degrees.

Fig. 728.

L. elodes.

The animal is of a dusky-greenish color, similar to that of the shell, varying like it in intensity, minutely dotted with amber-color. Foot somewhat paler, tongue-shaped, reaching about two thirds the length of the large whorl when in motion, obtusely rounded behind.

Ranging from New England, through Pennsylvania and Kansas, to California and Oregon. Very numerous in British America, reaching a high latitude, as shown by specimens from Hudson's Bay and Fort Resolution.

The animal attains maturity and dies about the end of June. At this time the young may be seen with the old, about an eighth of an inch in length, and these continue to grow rapidly during the season. But after the early part of July it is rare to find an adult shell containing a living animal. At this time the exterior of the shell is much eroded; in fact, the animals, as they cluster together, actually devour each other's shells; the aperture becomes white and

somewhat chalky, and the brown, sub-marginal callus of the outer lip is thus covered over.

The most common species found in Massachusetts, and one which it is exceedingly difficult to describe, or to determine if it has been already described. After much observation, and a comparison of many individuals collected from various localities, and an exchange of specimens with the most distinguished conchologists of this country, I have come to the conclusion that it must be regarded as the *L. elodes* of Say. Its European analogue is *L. palustris*. The only Massachusetts shell which bears much affinity to it is *L. desidiosa*, which is smaller, has a more slender spire, and larger aperture, proportionally. But it is closely related to *L. umbrosa* and *L. reflexa* of the Western and Middle States. The former is more solid, more corpulent, with the whorls and aperture more oblique, and its color darker than that of our shell. The latter has the whorls still more oblique, much less convex, forming a much less turreted and regularly tapering spire; the fold of the pillar much less prominent, and the color yellowish. After all, these species are so nearly allied, that no description, and perhaps no figure, will enable a person to determine any one of them by itself. They must be learned by comparison, and by interchanging specimens. But the difficulty does not end here. It is no easy matter to assign the limits of the species. No one presents a greater variety. The length of mature shells varies from half an inch to an inch; and it is remarkable that the largest specimens are usually the most fragile. The surface usually has an uneven, unfinished, inelegant aspect, coated with mud; but occasionally we find the conformation of the shell perfectly regular, the color a shining, greenish horn color, and the surface smooth and beautifully reticulated with longitudinal and revolving lines. It is then a very pretty, fragile shell. The aperture is small in proportion to the shell, generally rather contracted; again, we find the lip beginning to expand, and in some specimens received from Vermont, which I suppose to belong to this species, the lip is broadly flaring. Young specimens might be confounded with *L. umbilicata*, *L. desidiosa*, *L. modicellus*, and *L. caperata;* but a little attention to the umbilicus, the aperture, the color, and the revolving lines will enable us to distinguish them respectively. The umbilicus is usually entirely obstructed by the overlaying callus; but in some specimens it is partially open.

[In my "Land and Fresh-Water Shells of North America," Part II. p. 44, I have referred this species to *L. palustris*, Müller. — W. G. B.]

Limnæa desidiosa.

FIG. 150.

Shell ovate-elongate, turreted; whorls five, convex, the upper ones very small; suture deep; aperture sub-ovate, longer than the spire; sub-umbilicated.

Limnæa desidiosa, SAY, Journ. A. N. S. ii. 169 (1821); Long's Exped. ii. 263; Am. Conch vi. pl. 50, fig. 5; ed. BINN. 66, pl. 55, fig. 3. — ADAMS, Shells of Vermont, 154 (1842). — DE KAY, N. Y. Moll. 73, pl. 5, fig. 78 (1843). —KUSTER, in CHEMN. 2d ed. 47, pl. 8, figs. 22 - 26 (*Limnæus*). — GOULD, Inv. of Mass. 219, fig. 150 (1841). — HALDEMAN, Mon. p. 31, pl. 10; p. 48, pl. 13, figs. 16 - 18 (1842). — ANONY. Can. Nat. ii. 198, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells ii. 48, figs. 68 - 73 (1865).

Limnæa acuta, LEA, Tr. Am. Phil. Soc. v. 114, pl. 19, fig. 81 (1837); Obs. i. 226.

Limnæa obrussa, SAY, J. A. N. Sc. v. 123 (1825); BINNEY's ed. 113. — DE KAY, N. Y. Moll. 75 (1843).

Limnæa philadelphica, LEA, Proc. Am. Phil. Soc. ii. 32 (1841); Tr. ix. 8 (1844); Obs. iv. 8.

Limnæa fusiformis, LEA, Pr. Am. Phil. Soc. ii. 33 (1841); Tr. ix. 10 (1844); Obs. iv. 10.

Shell ovate, thin and fragile, the spire elongated and turreted; color a pale, dirty yellowish-green; whorls five, very convex, and for the most part suddenly contracted above, so as to present a conspicuous shoulder; the two or three uppermost whorls are very small, and the body whorl about seven tenths the length of the whole shell; surface generally dead, and somewhat checked with irregular revolving and longitudinal raised lines; aperture large, usually three fifths the length of the shell, oval, broadly and sub-equally rounded both behind and before; the lip is considerably everted in front, and along the left margin, where it is not closely appressed to the whorl, and leaves a small, but evident umbilical opening; callus rather abundant; fold on the pillar slight, and smoothly rounded. Length, half an inch; of aperture, three fifths of an inch; breadth, nine fortieths of an inch; divergence, forty-five degrees.

Fig. 729.

L. desidiosa.

This species is found in most regions, about the muddy margins of ponds and pools. From New England to Kansas.

It is intermediate between *L. elodes* and *L. humilis*. Its spire is proportionally more slender, its suture deeper, its aperture proportionally large and more oval, the fold of its columella much less conspicuous, and it is a much more fragile shell than the former. The latter, while it has the large, oval aperture, the deep suture and shouldered whorls, is still more fragile, of a deep green color, and is a short, inflated shell, with a much greater divergence of

the spire, and with one whorl more than *L. desidiosa*. The habits of the two last are similar, but the animal of *desidiosa* is a much lighter green, and has not the remarkable white dots between the tentacula.

The characters of the aperture and spire seem to be constant; that is, the aperture is always large and broadly rounded behind; and the spire is tapering, the two whorls at the tip seeming somewhat as if superadded; so that if a line should pass down one side so as to touch all the whorls, this line would be concave. The only variations I have noticed are, that the suture is sometimes shallow, and the shoulder nearly wanting, so as to render the spire more regularly tapering. Mr. Say's description is not definite, and his figure is much shorter than the dimensions he ascribes to it. He gives its length seven tenths of an inch, while it rarely exceeds half an inch.

Limnæa catascopium.

Shell ovate, strong, chestnut brown; whorls four, wrinkled, convex, the last large; suture deep; aperture sub-oval, half the length of the shell.

Limnæa catascopium, SAY, Nich. Ency. pl. 11, fig. 3 (1817, 1818, 1819); Am. Conch. vi. pl. 55, fig. 2 (1834); ed. BINNEY, 45, 211, pl. 70, fig. 3; pl. 55, fig. 2. — HALDEMAN, Mon. 6, pl. i. (1841). — GOULD, Inv. of Mass. 223 (1841). — DE KAY, N. Y. Moll. 67, pl. 6, fig. 80 (1843). — MRS. GRAY, Fig. Moll. An. pl. 310, fig. 7. — KÜSTER, in CHEMN. 2d ed. (*Limnæus*), 46, pl. 8, figs. 15–21. — POTIEZ et MICHAUD, Gal. des Moll. i. 216, pl. 21, figs. 3, 4. — ANON. Can. Nat. ii. 201, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 53, figs. 80–84 (1865).

Limnæa cornea, VALENCIENNES, Humb. & Bonpl. Rec. 1833, ii. 251.

Limnæa pinguis, SAY, J. A. N. Sc. v. 123 (1825); ed. BINNEY, 114 (not of DOHRN, Pr. Zool. Soc. 1858, 134).

Limnæa Virginiana, LAMARCK, An. sans Vert. vi. 160. — DESHAYES, in LAM. 8, 411; 2d ed. iii. 416; Encyc. Méth. Vers, ii. 362 (1830). — DELESSERT, Rec. des Coq. xxx. 4 (1831).

Limnæa striata, ZIEGLER teste HALDEMAN.

Helix catascopius, EATON, Zool. Text Book, 195 (1826).

Shell rather large, oblong-ovate, ventricose, thick and strong; epidermis chestnut or brownish horn color; whorls four or a little more, forming a short, pointed spire, delicately but rather regularly wrinkled by the lines of growth, and these are rendered somewhat corrugated by obsolete revolving lines; last whorl constituting nearly the whole shell, very much distended; suture deeply impressed; spire very short, acute at apex; aperture rather more than half the length of the shell, sub-oval, very little narrowed behind, not dilated; right lip simple, thick, and regularly

Fig. 730.

L. catascopium.

curved; left lip having a thick, narrow layer of enamel, and a rather slight fold midway; umbilicus not open. Length, seven tenths of an inch; breadth, four tenths of an inch; divergence, sixty degrees.

Found in the southern parts of this State, but I have not met with it near Boston. From New England to Lewis River.

Its great solidity, and its remarkably broad, corpulent aspect, approximating in character to *Paludina*, cause it to be easily recognized. Its analogue on the European continent is *L. perèger*, which, however, differs from this in being a less solid shell, in having the aperture somewhat expanded, its anterior curve broader, and the fold of the pillar less deep. It comes nearer to *L. emarginata* than to any other American species.

Limnæa umbilicata.

Fig. 149.

Shell small, ovate; whorls five, rounded, and marked with fine decussating lines; suture deeply impressed; aperture small, oval; no conspicuous fold on the columella; umbilicus distinct.

Limnæa umbilicata, Adams, Bost. Journ. Nat. Hist. iii. 325, pl. 3, fig. 14; Sillim. Journ. xxxix. 374. — Gould, Inv. 218, fig. 149.
Limnæa caperata, teste W. G. Binney.

Shell small, short-ovate, apex obtuse; whorls five, very convex and rounded, slightly oblique, their surface reticulated with fine lines, and modified by numerous facets or indentations, arranged in imperfect revolving series, four or five in number; suture deeply impressed; aperture small, about half the length of the shell, broad oval, not expanded but rather seeming contracted; outer lip sharp, thickened within by a sub-marginal, pinkish colored deposit; passing backwards on the inner side in a smooth and rounded plate, it joins the preceding whorl at about half the height of the aperture; a thin glazing of enamel covers the remainder of the inner margin. There is scarcely any approach to a fold on the pillar; umbilicus large and deep. Length, three tenths of an inch; breadth, one fifth of an inch; divergence, sixty-five degrees.

Fig. 731.

L. umbilicata.

First collected by Mr. Shiverick at New Bedford. From New England to Michigan (*Binney*); Jamaica (*Adams*).

Limnæa humilis is of about the same size and general appearance; but its surface is smooth, its whorls more oblique, its mouth

twice as large, and it has no conspicuous umbilicus. *L. caperata* is similar in its form, and its small, oval aperture, but is at once recognized by the regular revolving, hispid lines. Fig. 732 represents a specimen of the last from Massachusetts.

Fig. 732.

L. caperata.

[Referred by me to *L. caperata* in "Land and Fresh-Water Shells," ii. 56. — W. G. B.

Limnæa pallida.

Shell ovate-fusiform, pale horn color; whorls five and a half, moderately convex; aperture sub-ovate, five ninths of the length of the shell; columella fold distinct; umbilicus rather small.

Limnæa pallida, Adams, Am. Journ. Sc. [1], xxxix. 374 (1840); Bost. Journ. Nat. Hist. iii. 324, pl. 3, fig. 13 (1840); Shells of Vermont, 153 (1842). — Haldeman, Mon. 45, pl. 13, figs. 11–13 (1842). — De Kay, N. Y. Moll. 69, pl. 4, fig. 67 (1843). — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 60, fig. 95 (1865).

Shell moderately elongate, ovate-fusiform, very pale horn color, semi-transparent, not very thin, with fine irregular striæ of growth, without revolving striæ; whorls about five and a half, moderately convex; suture well-impressed; spire four ninths of the length of the shell, acutely conic, its opposite sides containing an angle of about forty-five degrees, subacute at tip; body whorl not much enlarged, somewhat produced below; aperture five ninths of the length of the shell, sub-ovate acute above, angle of its plane with the axis of the shell about fifteen degrees, of its length with the axis about ten degrees; labrum not thickened internally; fold of the columella distinct, but not very large; umbilicus rather small. Length, forty-eight hundredths of an inch; breadth, twenty-two hundredths of an inch. Cabinets of the Boston Soc. N. H.; of Middlebury College; of Dr. A. A. Gould, of Boston; of J. G. Anthony, of Cincinnati; and my own.

Fig. 733.

L. pallida.

This species was found in considerable numbers at Storeham, Vt., on the shore of Lake Champlain, clinging to rocks and stones.

This species most resembles *L. acuta*, Lea, of which, however, I have not seen a specimen. That shell, in a very brief description, is said to be delicate, smooth, and dark brown, while this is rather strong, striate, and of a very pale horn color, in living specimens, like the weathered shells of kindred species. The figure represents the columella of the *acuta* as intruding upon the aperture, which is not the case with this shell. (*Adams.*)

Found from New England to Michigan, and apparently in California. Mr. Lea quotes it from San Antonio Arroya.

Limnæa humilis.

Fig. 151.

Shell ovate, thin, light olive colored; whorls four, convex; suture deep; aperture rather large, ovate; fold of columella conspicuous; sub-umbilicated.

Limnæa humilis, Say, Journ. A. N. S. ii. 378 (1822); Binney's ed. 110. — Haldeman, Mon. 41, pl. 13, figs. 1 - 8 (1842). — De Kay, N. Y. Moll. 71, pl. 4, fig. 71 (1843). — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 63, fig. 99 - 109 (1865).
Limnæus modicella, Say, J. A. N. Sc. v. 122 (1825); Binney's ed. 113. — Gould, Inv. of Mass. 218, fig. 151 (1841).
Limnæa Linsleyi, De Kay, N. Y. Moll. 72, pl. 4, fig. 74 (1843). — Linsley, Shells of Conn. Am. Journ. Sc. [1], xlviii. 282 (1845).
Limnæa parva, Lea, Proc. Am. Phil. Soc. ii. 33 (1841); Tr. ix. 11 (1844); Obs. iv. 11.
Limnæa plica, Lea, Proc. Am Phil. Soc. ii. 33 (1841); Tr. ix. 10; Obs. ix. 10 (1844).
Limnæa Griffithiana, Lea, l. c. ii. 33 (1841); ix. 8 (1844); Obs. iv. 8.
Limnæa planulata, Lea, l. c. ii. 33 (1841); ix. 9 (1844); Obs. iv. 9.
Limnæa rustica, Lea, l. c. ii. 33 (1841); ix. 10 (1844); Obs. iv. 10.
Limnæa exigua, Lea, l. c. ii. 33 (1841); ix. 9 (1844); Obs ix. 10.
Limnæa curta, Lea, l. c. ii. 33 (1841); ix. 11 (1844); Obs. iv. 11.

Fig. 734.

L. humilis.

Shell small and short-ovate, very thin and transparent, color a light olive or sea-green; whorls four or five, convexly rounded and somewhat shouldered or flattened above; surface rather coarsely marked by the lines of growth; anterior whorl large and inflated, two thirds the length of the shell; posterior whorls small; suture deep; aperture rather large, somewhat more than half the length of the shell, ovate, or nearly as broad behind as before, not acutely rounded behind, but considerably arched; slightly effuse at base; columella arched, its fold conspicuous; inner lip reflected over a small umbilicus, and the enamel usually broadly spread across to the posterior angle. Length, seven twentieths of an inch; breadth, four twentieths of an inch; divergence, sixty-eight degrees.

Lives along the muddy margins of brooks.

The animal is of a dark sea-green or bottle-green color above, dotted with amber color; beneath much paler. Foot long, and inclining to a point behind. In the region of the eyes, between the tentacula, are clusters of white points, which give an appearance of white eyes. The animal seems to shun immersion, being usually found on the damp mud at the margins of ponds and brooks. When put in a vessel of water it soon rises above the surface, crawls

about the table, and will remain out of water two or three days without injury. The shell is usually thickly coated with mud.

This species is distinguished from the young of *L. elodes* by the depth of the suture, and the maturity of its aperture, which is also proportionally larger. It is less elongated than *L. desidiosa*, its suture is deeper, its aperture rather smaller, and the color is quite different.

Ranges from Nova Scotia to Georgia, and from Kansas to Lake Superior.

Genus PHYSA, Draparnaud. 1801.

Tentacles slender, setaceous. Mantle covering part of the shell, the margin fringed or digitate. Foot long, acuminate behind.

Shell sinistral, oblong, thin, and polished; spire acute; aperture oval, rounded anteriorly, not dilated; inner lip spread over the last whorl, simple in front; outer lip acute.

Jaw single, superior, chevron-shaped.

Lingual membrane with numerous transverse rows of teeth, arranged *en chevron;* teeth long and slender with long lateral denticles.

This genus is widely distributed over the globe, and is numerous in species in this country, where it extends more southerly than *Limnæa*. In its habits it is more active than the other *Limnæidæ*, both in walking and in gliding, shell downwards, on the surface of the water.

It will be seen in the generic descriptions of *Physa* and *Bulinus* that the former name is restricted to those species having a digitated mantle, and the latter applied only to those whose mantle is simple. As Adanson founded his genus on a species having a simple mantle, his name is retained for the last section, leaving Draparnaud's later name for the first section. Thus any confusion of synonymy is avoided.

Physa heterostropha.

Fig. 141.

Shell ovate, smooth, yellowish-green; whorls four, inflated, suture distinct, surface reticulated.

Limnæa heterostropha, Say, Am. ed. Nich. Encyc. pl. i. fig. 6 (1817, 1818, 1819); Binney's ed. 46, pl. 69, fig. 6.

Physa heterostropha, Say, Journ. Acad. Nat. Sc. ii. 172 (1821); Binney's ed. 68. — Haldeman, Mon. 23, pl. 2, figs. 1–9 (1843). — Gould, Inv. 211, fig. 141 (1841). — Adams, Shells of Vt. 154 (1842). — Deshayes, in Lam. An. sans Vert. viii. 402; 2d ed. iii. 412. — De Kay, N. Y. Moll. 76, pl. 5, fig. 82 (1843). — Chemnitz, 2d ed. 7, pl. 1, figs. 7, 8. — Mrs. Gray, Fig. Moll. An. pl. 310, fig. 9. — Potiez et Michaud, Gal. des Moll. i. 224, pl. 22, figs. 15, 16. — Anony. Canad. Nat. ii. 209, fig. (1857). — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 84, figs. 144, 145 (1865).

Physa fontana, Haldeman, Mon. part 2, p 3 of cover (1841).

Physa cylindrica, Newcomb, in De Kay, N. Y. Moll. 77, pl. 5, fig. 82 (1843).

Physa aurea, Lea, Trans. Am. Phil. Soc. vi. 18, pl. 23, fig. 106; Obs. ii. 18 (1839). — De Kay, N. Y. Moll. 80, pl. 5, fig. 89 (1843).

Physa plicata, De Kay, N. Y. Moll. 78, pl. 5, fig. 85 (1843).

Physa osculans, Haldeman, Mon. part, figs. 11, 12.

Physa striata, Menke, Syn. Méth. 2d ed. 132 (1830), teste Haldeman.

Physa subarata, Menke, Syn. Méth. 2d ed. 132 (1830), teste Haldeman.

Physa Charpentieri, Küster, in Chemn. 2d ed. 23, pl. 4, figs. 4–6.

Physa Philippi, Küster, in Chemn. 2d ed. 19, pl. 3, figs. 3–6.

Physa inflata, Lea, Proc. Am. Phil. Soc. ii. 32; Trans. ix. 7; Obs. iv. 7.

Helix heterostrophus, Eaton, Zool. Text Book, 195 (1826).

Bulla crassula, Dillwyn, Conch. t. 1, 487, No. 36 = *fontinalis*, Chemnitz, Conch. ix. 33, pl. 103, figs. 879, 880, var. 3. — Gmélin, Syst. 3407. — Schroter, Einl. t. 1, 261, *Helix*, No. 84.

Cochlea neritoides, Lister, Conch. pl. 135, fig. 34.

"Shell sinistral, sub-ovate; color pale yellow, chestnut, or blackish; whorls four, the first large, the others very small, terminating rather abruptly in an acute apex; aperture large, somewhat oval, three fourths the length of the shell, or rather more; within of a pearly lustre, often blackish; lip a little thickened on the inside, and tinged with dull red." (Say, in "Nich. Encyc.") Ordinary length, about half an inch; breadth, one fourth of an inch; divergence, sixty-eight degrees. My largest specimen is seven tenths of an inch by two fifths of an inch.

Fig. 735.

P. heterostropha.

When the shell is fresh and perfectly clean it is always of a light greenish-yellow, and becomes a little more dusky with age. The surface, under the magnifier, appears beautifully checkered with minute, revolving, and longitudinal lines, which are also a little waved. Sometimes there are one or more whitish, opaque bands, as if scratched by the mantle of the animal. The thickening of the lip is found only in old specimens, and in these also there is a broad layer of pearly enamel reflected over the columella, which has also a very prominent fold.

The animal is olivaceous, surface very smooth and silky; the foot is kite-shaped, longer than the shell, terminating in an acute point; expansions each side of the mouth acutely angled; tentacula oli-

vaceous above, light ferruginous beneath, long and thread-like. The pointed lobes of the mantle are very conspicuous.

The motions of the animal are very rapid, and it seems to move with equal facility in an inverted posture, at the surface of the water.

The ova are excluded, enveloped in a gelatinous substance, about twelve or fifteen in number, and of an egg-shaped form. In about a fortnight they escape from the jelly, and move about with great rapidity. In fact, they are seen in motion for some time previous, apparently struggling to disengage themselves from their nidus.

This shell is everywhere to be found. Scarcely a brook or pool is met with but some of these shells will be found in it. It is more especially to be found in the running brooks.

[Of this species I have seen specimens from Texas and Georgia, and from as far north as Great Slave Lake. It ranges from the Atlantic to the Pacific. It is our most common species.

Physa ancillaria.

FIG. 142.

Shell ovate-globose, pale yellowish; whorls four, smooth, suture not impressed; aperture nearly as long as the shell.

Physa ancillaria, SAY, Journ. Acad. Nat. Sc. v. 124 (1825); BINNEY's ed. 114. — HALDEMAN, Mon. 27, pl. 3, figs. 1 - 10 (1843). — GOULD, Inv. 213, fig. 142 (1841). — ADAMS, Shells of Vermont, 154 (1842). — DE KAY, N. Y. Moll. 78, pl. 5, fig. 90 (1843). — CHEMNITZ, 2d ed. 20, pl. 12, figs. 12, 13. — CHENU, Man. de Conch. ii. 480, fig. 3550. — ANON. Can. Nat. ii. 211, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 81, fig. 139 (1865).

Physa obesa, DE KAY, N. Y. Moll. 78, pl. 5, fig. 86 (1843).

"Shell heterostrophe, sub-globose, pale yellowish; whorls rather more than four, very rapidly attenuated; spire truncated, hardly elevated beyond the general curve of the surface; suture not impressed; aperture but little shorter than the shell, dilated; labium a little thickened on the inner sub-margin." (*Say.*) Length, eleven twentieths of an inch; breadth, seven twentieths of an inch; divergence, ninety degrees.

Fig. 736.

P. ancillaria.

Found in Connecticut and Merrimac Rivers, Fresh Pond, &c., to Louisiana.

Animal of a bright lemon color.

This shell is distinguished from the preceding by its much shorter spire, more angular outline, and especially by its suture, the margin of one whorl being so closely and perfectly applied to the preceding

as to give the appearance of a double suture. The surface is exceedingly smooth, no revolving lines being detected by the magnifier. The base of the aperture is somewhat narrowed, and prolonged downwards, and considerably effuse. The twisted fold of the columella is less conspicuous than in *P. heterostropha*. The shell becomes more ponderous and yellowish by age; and the reddish rib along the outer lip, and the enamel on the columella, much thicker.

Genus BULINUS, Adanson. 1757.

Fig. 737.

Animal of *B. elongatus*.

Tentacles filiform, setaceous. Mantle simple-edged, and not reflexed over the shell. Foot long, acuminate behind.

Shell sinistrorsal, elongated, polished, thin; spire acuminated; aperture narrow, produced anteriorly; inner lip simple; outer lip acute.

Jaw (of *B. hypnorum*) strongly arched, narrow, cartilaginous, brown.

Bulinus differs from *Physa* in having a simple, unfringed mantle. The shell is also more slender and more highly polished. It is less common in North America than *Physa*, but usually appears of a large size. *Bulinus princeps*, Phillips of Central America, and some of the South American species, are remarkably well developed.

Adanson's name *Bulinus* has priority over *Aplexa*, Fleming, and *Nauta*, Leach, and is accompanied by a careful description and excellent figure.

Bulinus elongatus.

Fig. 143.

Shell thin, slender, elongated, apex acute, pale yellowish; whorls six, polished; suture slightly impressed; aperture half as long as the shell.

Physa hypnorum, Haldeman, Mon. 36, pl. 5. figs. 4 – 9 (1842). — Adams, Shells of Vermont, 154 (1842).

Physa elongata, Say, Journ. Acad. Nat. Sc. ii. 171 (1821); Binney's ed. 68. — Gould, Inv. 214, fig. 143 (1841). — De Kay, N. Y. Moll. 81, pl. 6, fig. 346 (1843). — Anon. Can. Nat. ii. 211, fig. (1857).

Physa glabra, De Kay, N. Y. Moll. 80, pl. 5, fig. 83 (1843).

Physa elongatina, Lewis, Bost. Pr. v. 122, 298 (1855).

Physa turrita, J. de C. Sowb. Fauna Bor.-Am. iii. 315.

Aplexa hypnorum, Chenu, Man. de Conch. ii. 481, fig. 3556.

Bulinus hypnorum, W. G. Binney, Smith. Inst. L. and Fr. W. Sh. ii. 99, fig. 170 (1865).

"Shell heterostrophe, pale yellowish, very fragile, diaphanous, oblong; whorls six or seven; spire tapering, acute at tip; suture slightly impressed; aperture not dilated, attenuated above, about half as long as the shell; columella much narrowed near the base, so that the view may be partially extended from the base towards the apex." (*Say.*) Length, half an inch; breadth, one fifth of an inch; divergence, thirty-four degrees.

Fig. 738.

B. elongatus.

Found in stagnant waters in all the northern and western parts of the United States. In the vicinity of Boston it is rare.

Animal dusky, the head above of an orange hue; tentacula rather short and blunt, lighter at tip; respiratory groove long, narrow, and thin, movable in various directions, almost as long as a tentacle, with two black spots like eyes near its tip.

This species is easily recognized by its slender, elongated form, and the great proportionate length of the spire. It is in every respect similar to *Physa hypnorum* of Europe, unless, perhaps, its spire may be somewhat more produced.

It is not very common in Massachusetts, and is seldom found as long as the above dimensions; while Mr. Say gives it seven tenths of an inch in Illinois.

Mr. Say describes the animal as black, and spotless above and below; tentacula with a white ring at base. He must have observed them at a more advanced age than any I have seen living; or else the species observed are different.

The difference between this and *Physa fontinalis* of Europe is very slight. The spire may be a little more prolonged and acute.

It is quite interesting to keep a number of them in a vessel of water, and observe their motions and habits. The manner in which they open their mouths and display the lingual organ, the manner in which they rise to the surface and open the air cavity, into which its structure permits no water to enter, and, above all, the beautiful and unaccountable manner in which it glides along, will never fail to excite astonishment. They feed freely upon any kind of vegetable.

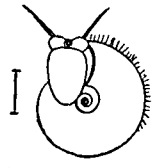
We have here an instance of the interminable chain of existences, and of the subserviency of one animal to another. And it is curious, too, that in general we have the power to elude or subdue animals of greater strength and magnitude than ourselves, much better than we can those which are inferior to us. On looking carefully about the neck of the animal of this shell, we find him beset with numerous little things looking like short, minute, white lines,

which are, in truth, little parasites (*Gordius inquilinus*, Müll.) attached like leeches, and which derive their nourishment from the fluids of the animal, without his having the power to dislodge them.

[From Kansas to the District of Columbia, and from the Atlantic to the Pacific in the British possessions, ranging as far north as Russian America. It is one of the species common to the three continents. I consider it identical with the *B. hypnorum*.

Genus PLANORBIS, Guettard. 1756.

Fig. 739.



Animal of *P. hirsutus*.

Tentacles slender, filiform. Foot short, ovate.

Shell dextral, discoidal; spire depressed, whorls numerous, visible on both sides; aperture crescentic, or transversely oval; peristome thin, incomplete, the upper margin produced.

Jaw single, superior, arched.

Lingual membrane short, with broad, stout teeth; apices recurved and prolonged into tusk-like tubercles.

The genus *Planorbis* is widely distributed over the globe, but usually prefers the more temperate regions. It is found in every part of this continent, reaching into Mexico, and apparently much more abundant there than the other genera of the family.

Most of the sections or sub-genera are represented in North America. The South American *Taphius* is most nearly allied to the *Carinifex* of the Pacific coast.

The name *Planorbis* is now universally applied to the genus.

The species of this genus have a dextral shell, but the orifices of the generative, excretory, and respiratory organs are on the left of the animal, as in *Physa*. They are sluggish in their habits, preferring stagnant pools.

Say considered the shells sinistral, a fact which must be borne in mind while studying his descriptions.

Planorbis trivolvis.

Fig. 131.

Shell concave on both sides; whorls four, strongly carinated on the left side; aperture acutely angulated by the carina, right margin extending beyond the plane of that side.

Planorbis trivolvis, Say, Nich. Encyc. pl. 2, fig. 2 (1817, 1818, 1819); Am. Conch. part 6, pl. 54, fig. 2 (1834); Binney's ed. 44, pl. 70, fig. 2; pl. 54, fig. 2. — De Kay, N.

Y. Moll. 59, pl. 4, fig. 59, *a*, *b* (1843). — GOULD, Inv. of Mass. 201, fig. 131 (1841). — HALDEMAN, Mon. 13, pl. 2, figs. 4 – 7 (1844). — ADAMS, Shells of Vt. 154 (1842). — KÜSTER, in CHEMN. 2d ed. 53, pl. 5, figs. 4 – 6; pl. 6, figs. 1 – 6, 20 – 25. — POTIEZ et MICHAUD, Gal. des Moll. i. 214, pl. 21, figs. 19 – 21. — ANON. Can. Nat. ii. 202, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 115, figs. 194 – 201 (1865).

Bulla fluviatilis, SAY, Journ. Acad. Nat. Sc. ii. 178; ed. BINNEY, 71.

Planorbis regularis, LEA, Tr. Am Phil. Soc. ix. 6; Proc. ii. 32 (1841); Obs. iv. 6.

Planorbis megastoma, DE KAY, N. Y. Moll. 61, pl. 4. figs. 60, 61 (1843).

Physa planorbula, DE KAY, N. Y. Moll. 76, pl. 5, fig. 83 (1843).

Planorbis corpulentus, DE KAY, N. Y. Moll. 64, pl. 13, fig. 185 (1843). — WHITTEMORE, Am. Journ. Sc. [1], xxxviii. 193.

? *Planorbis proboscideus*, POTIEZ and MICHAUD, Gal. des Moll. i. 213, pl. 25, figs. 13 – 15 (1838).

Planorbis macrostomus, WHITEAVES, Can. Nat. viii. 113, fig. (1863).

Planorbis trivolvis, var. *fallax*, HALDEMAN, Mon. 15, pl. 3, figs. 1 – 3 (1844)

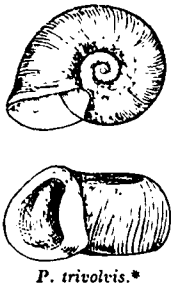
? *Planorbis lentus*, GOULD, Inv. 202, fig. 132 (1841).

Helix trivolvis, EATON, Zool. Text Book, 194 (1826).

Cochlea trium orbum, LISTER, Conch. pl. 140, fig. 46. — PETIVER, Gazophyl. pl. 106, fig. 16.

Shell orbicular, yellowish-white, brownish, or chestnut color; umbilicated on the right side, cup-shaped on the left; on the right side scarcely three volutions, separated by a profound suture, are visible as they disappear in the umbilicus, their faces, especially those of the interior whorls, being slightly carinated; on the left side at least four whorls are seen, which, by their faces, form a cup-shaped depression, scarcely distinguished by the suture, except the last half of the outer whorl, on the whole of which a well-marked carina revolves, forming a margin to the cup; the carina gives the whorl a flattened appearance on this side; surface covered with fine, regular, raised, transverse lines, somewhat grooved between them; aperture sub-ovate, inclining to the right, its right margin more advanced than the left, broadly and regularly rounded; left lip abruptly angulated where the carina terminates; lip usually thickened within, and of a reddish-brown color. Large diameter, seven tenths of an inch; small diameter three tenths of an inch.

Fig. 740.



*P. trivolvis.**

Animal dark russet or dusky, covered with pale yellowish dots.

Found in the western parts of this State in rivers and ponds. It is widely extended over the Northern and Western States.

Planorbis corpulentus of Say seems little else than an exuberant

* I arrange the figures as in Dr. Gould's plates, though the shells of the genus are now considered dextral. — W. G. B.

growth of this shell. The following differences may be noted. It is at least double, often three times, the size. It is a thinner shell. On the right side the revolutions are less compact, and exhibit a larger portion of each whorl; on the left side the suture is more and the carina less distinct; the aperture is much more expanded, and projects far to each side of the preceding whorl. Inhabits the vicinity of the Great Lakes. *P. trivolvis* differs from the next species, *P. lentus*, by its carina, and the position of its aperture.

[This species probably inhabits all of the United States and Canada. It has been found from Fort Simpson to the Red River of Louisiana, from Puget Sound to San Diego, in Utah, and from New England through the Western and Middle States. Poey catalogues it among the Cuban shells.

Planorbis lentus.

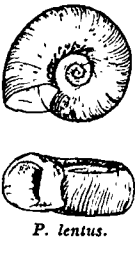
FIG. 132.

Shell concave on both sides, whorls four, sub-carinate on the left side; aperture nowhere distinctly angular, right margin in the plane of that side.

Planorbis lentus, SAY, Amer. Conch. pl. 54, fig. 1. — GOULD, Inv. 1st ed. 202, fig. 132.

Shell orbicular, each whorl encircling the preceding, greenish horn color at the circumference, yellowish at the sides and bordering the aperture; on the right side concave, exhibiting scarcely three rounded volutions, separated by a well-defined suture, and disappearing in a deep umbilicus; left side presents a shallow cup, formed of four compact, slightly carinated whorls, distinguished by a tolerably distinct suture; surface marked with raised, sub-equidistant lines of growth; aperture large, ovate, inclining to the right; lip on the right side slightly curved, lying in the plane of that side of the shell; in front, regularly and broadly arched; on the left side it stands out considerably beyond the preceding whorl, and undergoes a sudden curve before its junction with that whorl; the lip is sharp, very slightly spreading, and thickened within, by dark reddish-brown callus. Greater diameter, seven tenths of an inch; smaller diameter, five twentieths of an inch.

Fig. 741.



P. lentus.

Animal dark olivaceous above and below; foot oval, about one half the diameter of the shell in length, minutely dotted beneath, and frosted above with amber dots; these are abundant about the

bases of the tentacula; edges of mouth honey-yellow; motions sluggish.

Found abundantly in all our ponds, small brooks, and stagnant pools.

This is a somewhat darker shell than *P. trivolvis*, and is distinguished from it by its left side and its aperture. The cup of the left side is less smooth and regular, and is not bounded by the sharp, elevated line; when this shell is laid upon its right or upper side, the lip of that side will scarcely touch the plane on which it lies, while, in *P. trivolvis*, the shell would be lifted by the lip; the aperture has not the sharp angle of the left side, produced by the termination of the carina, but in the young stages it is difficult to distinguish the two. It is very closely allied to *P. corneus* of Europe; but in that shell the left side is scarcely concave, and the suture is deep; the aperture is nearly orbicular, being almost equally rounded on both sides.

This shell has hitherto generally borne the name of *P. trivolvis* in New England; but it is not the *trivolvis* of Say, and is either his *P. lentus* or a new species.

[Professor Haldeman refers it to *P. trivolvis*, var. *fallax*. In the "Land and Fresh-Water Shells," Part I., I refer it to *P. trivolvis*. It is not the *lentus* of Say.

Planorbis bicarinatus.

Fig. 134.

Shell deeply concave on both sides; whorls three, strongly carinated on both sides; aperture abruptly arched at the carina of the left side, its lip extending far beyond the plane of the preceding whorl.

Planorbis bicarinatus, Say, Nich. Encyc. pl. 1, fig. 4 (1817, 1818, 1819); Am. Conch. 6, pl. 54, fig. 3 (1834); Binney's ed. 44, pl. 54, fig. 3, pl. 69, fig. 4. — Mrs. Gray, Fig. Moll. An. pl. 310, fig. 1. — Haldeman. Mon. vii. 6, pl. 1, figs. 1–6 (1844). — Adams, Shells of Vt. 155 (1842). — De Kay, N. Y. Moll. 60, pl. 4, fig. 63 (1843). — Gould, Inv. of Mass. 203, fig. 134 (1841). — Chemn. 2d. ed. 56, pl. 60, figs. 11–13. — Potiez et Michaud, Gal. des Moll. i. 207, pl. 21, figs. 1–3. — Anon. Can. Nat. ii. 204, fig (1857). — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 123, figs. 205–207 (1865).

Helix angulata, Rackett, Lin. Tr. xiii. 42, pl. 5, fig. 1 (1822). — Wood, Cat. Suppl. pl. 7, fig. 12; Hanley's ed. 226.

Helix bicarinatus, Eaton, Zool. Text Book, 194 (1826).

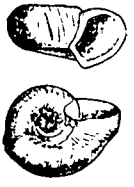
Planorbis engonatus, Conrad, N. Fresh W. Sh. Suppl. 8, pl. 9, fig. 8 (1834).

Lister, 139–144.

Shell orbicular, its tube rapidly increasing, deeply excavated on both sides, color brownish yellow on the carina. Whorls rather

more than three, as seen on both sides, forming on the right side a large and deep concavity, bounded by a sharp, raised line or carina, and on the left side a still deeper, inversely conic cavity, bounded by a similar carina, but of smaller circuit; surface rather smooth, with faint, irregular, lines of growth, most distinct on the right side; aperture ovate, right side broadest, and on the general plane of that side of the shell; left margin strongly modified by the carina, and extending far beyond the plane of the preceding whorl; lip slightly expanded, white; interior brownish, with white lines in the grooves answering to the carina. Longest diameter, half an inch; shortest diameter, three tenths of an inch.

Fig. 742.



P. bicarinatus.

Animal light russet color, beautifully dotted with amber; foot tongue-shaped, nearly as long as the diameter of the shell. The strong angle of the aperture fully displays the respiratory opening, which has a jagged flap, over which lies an acute groove; movements sluggish.

Inhabits still waters, not so generally pools as the margins of large ponds. Not very common.

This species is smaller than either of the preceding, and is at once distinguished from them by the very obvious angularity of the whorls on both sides, and by the very deep, conical cavity of the left side. Sometimes a few faint revolving lines may be found on the surface. The tentacula of the animal are usually very long, but sometimes one or both of them seem to have been broken.

[The species ranges from the British possessions to Kansas and Georgia.

Planorbis campanulatus.

FIG. 133.

Shell with the last whorl distorted, concave on both sides; whorls four, strongly carinate on the left, and sub-carinate on the right side; throat campanulate; aperture turned to the left.

Planorbis campanulatus, SAY, Journ. Acad. Nat. Sc. ii. 166 (1821); BINNEY'S ed. 64. — HALDEMAN, Mon. 9, pl. 1, figs. 7–11 (1844). — GOULD, Inv. 204, fig. 133 (1841). — ADAMS, Shells of Vt. 155 (1841). — DE KAY, N. Y. Moll. 61, pl. 5, figs. 99* *a*, *b* (1843). — KÜSTER, in CHEMN. 2d ed. 52, pl. 9, figs. 7–10. — ANON. Can. Nat. ii. 204, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 109, fig. 184 (1865).

Planorbis bellus, LEA, Tr. Am. Phil. Soc. ix. 6 (1844); Proc. ii. 32 (1841).

Planorbis bicarinatus, SOWERBY, Gen. pl. 4.

Planorbella campanulata, CHENU, Man. de Conch. ii. 482, fig. 3559.
Helix angulata, SHEPPARD, teste J. DE C. SOWERBY, Fauna Boreali-Americana, iii. 315.

Shell discoidal, yellowish or brownish-green, lighter at the sides; diameter of its tube nearly twice as great from side to side as in the contrary direction; right side exhibiting scarcely more than two whorls, which are elevated to an obtuse ridge, and form an umbilical vortex very nearly perforating the shell; on the right side are four volutions, distinctly separated by the suture, which are carinated, and form a shallow, salver-shaped depression; the whorls enclose each other in a very regular spiral to the last fifth of the outer one, when there is a sudden enlargement and distortion towards the left, by which a large, bell-shaped throat is formed; aperture also dilated, and strongly angular on the left side; within glazed, reflecting light blue and brown; surface regularly marked with fine, transverse, raised lines, and intervening grooves. Greatest diameter, half an inch; at right angles with this, two fifths of an inch; small diameter, one fifth of an inch.

Fig. 743.

P. campanulatus.

Found in the larger collections of fresh water, at Fresh Pond, Jamaica Pond, &c.

It ranges from New England and Nova Scotia through the northern tier of States to Minnesota. Fossil in post-pleiocene of Ottawa Valley.

This shell does not attain the size of the preceding species; and, when mature, its dilated throat distinguishes it from every other known species, and the remarkable manner in which it is turned, as it were by violence, so as to look to the left, is a still further distinction. The outer whorl is everywhere of the same breadth; and the immature shell, before the dilatation of the throat, may be known by the very regular enrolment of the whorls, and the very contracted aperture in consequence of the very unequal diameters.

Planorbis hirsutus.

FIG. 135.

Shell light yellowish-brown, concave on both sides, most so on the left; whorls three; surface beset with revolving lines of rigid hairs; aperture large, very oblique.

Planorbis albus, MÜLLER, HALDEMAN, Mon. 29, pl. 4, figs. 8–10 (1844). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 132, figs. 219, 220 (1865).
Planorbis hirsutus, GOULD, Am. Journ. Sc. [1], xxxviii. 196 (1840); Inv. of Mass. 206,

fig. 135 (1841); Otia, 180. — Adams, Shells of Vt. 156 (1842). — De Kay, N. Y. Moll. 64 (1843). — Anon. Can. Nat. ii. 206, fig. (1857).

Shell small, somewhat transparent, of a brownish-yellow color; both sides concave, the left rather more than the right, but the concavity is there more limited by the presence of a sub-angular ridge on the outer whorl; whorls three, the outer one rapidly increasing; surface exhibiting traces of revolving lines when denuded, but usually covered with a dark pigment or epidermis, bristling with rigid hairs, which are arranged in close revolving lines; lines of growth very faint; aperture sub-oval, oblique, its diameter from side to side shorter than in the opposite direction; its plane very oblique. Long diameter, one fifth of an inch; shorter diameter, one fifteenth of an inch.

Fig. 744.

P. hirsutus.

Animal has the head slate-colored above, with a darker line along each tentaculum, not originating from the eyes; foot chestnut colored.

This shell was first found by Professor C. B. Adams, in Mansfield, from whom I received it. I have since found it in several localities in Dorchester, Dedham, and Cambridge, adhering to sticks in stagnant water; and it may doubtless be found in all similar localities.

This *Planorbis*, though in many respects it resembles in shape *P. deflectus*, is readily distinguished from all other American species by the revolving hairy lines. It is the analogue of the European *P. albus*, from which it is difficult to designate any very characteristic difference. It is, however, a thinner shell, the last whorl increasing more rapidly; and it maintains its yellowish horn color, whereas *P. albus* assumes a spermaceti or still whiter appearance. The lines, too, disappear more entirely when the epidermis is gone.

[Said to have been found from New England to the Saskatchewan, and in the District of Columbia. I refer it to *P. albus*.

Planorbis deflectus.

Fig. 136.

Shell concave on the left side; whitish horn color; whorls four, compressed, sub-carinated; aperture greatly declining.

Planorbis deflectus, Say, Long's Exped. ii. 261, pl. 15, fig. 8 (1824); Binney's ed. 128, pl. 74, fig. 8. — Haldeman, Mon. 25, pl. 4, figs. 4–7 (1844). — Gould, Inv. 207, fig. 136 (1841). — Adams, Shells of Vermont, 156 (1842). — De Kay, N. Y. Moll. 65 (1843). — Anon. Can. Nat. ii. 206, fig. (1857). — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 129, figs. 215–217 (1865).

Planorbis virens, ADAMS, Am. Journ. Sc. [1], xxxix. 274 (1840); Bost. Journ. iii. 326, pl. 3, fig. 15 (1840). — DE KAY, N. Y. Moll. 66 (1843).
Planorbis obliquus, DE KAY, N. Y. Moll. 62, pl. 4, figs. 57 *a*, *b* (1843).
Nautilina deflecta, CHENU, Man. de Conch. ii. 482, fig. 3566.

Shell small, distorted, compressed, of a light greenish-yellow color, something like dirty, bleached wax; right side in general convex, but with the centre slightly indented, suture distinct; left or under side concave, forming an expanded umbilicus, exhibiting about one half of each volution; whorls four or five, very much compressed, and reduced to a somewhat carinated perimeter; the last fourth of the outer whorl turns, somewhat suddenly and quite remarkably, to the left, or downwards; aperture large, ovate, lip commencing below the carina, and embracing but a very small portion of the preceding whorl; much narrower from side to side, its plane very oblique to the axis of the shell; lip simple, very slightly everted beneath; surface finely wrinkled by the lines of growth. Greater diameter, three tenths of an inch; smaller diameter, one fifteenth of an inch.

Fig. 745.

P. deflectus.

Animal dusky above, and with a still darker line to tip of tentacula.

Found in all our ponds, clinging to sticks, stones, &c.

It is distinguished at once, except in its very early stages, by the remarkable manner in which a portion of the last whorl is diverted from its regular course, downwards, if we consider the shell to be lying on its concave face. It is almost entirely turned off from the preceding whorls, so that the aperture comes in contact with only about half of its lower face. When immature it may be recognized by its light color and concave form. Scattered hairs may often be observed upon its surface. It has a general resemblance in its structure to *P. exacutus*, but the constantly sharp edge of that species is a never-failing mark of distinction. I must at present regard the *P. virens* of Adams ("Bost. Journ. Nat. Hist." iii. pl. 3, fig. 16) as a variety of this species, in which the last whorl is not remarkably diverted from its regular course.

[This species is said to range from Great Slave Lake to the District of Columbia, and from New England to Nebraska.

Planorbis exacutus.

FIG. 137.

Shell lenticular, umbilicated; whorls four, broader than high, gradually thinning to a sharp edge.

Planorbis exacutus, Say, Journ. Acad. Nat. Sc. ii. 165 (1821); Binney's ed. 64. — Haldeman, Mon. 21, pl. 4, figs. 1–3 (1844). — Gould, Inv. of Mass. 208, fig. 137 (1841). — Adams, Shells of Vt. 155 (1842). — De Kay, N. Y. Moll. 63, pl. 55, fig. 62 *a*, *b* (1843). — Anon. Can. Nat. ii. 207, fig. (1857). — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 126, figs. 210–213 (1865).

Planorbis lens, Lea, Tr. Am. Phil. Soc. vi. 68, pl. 23, fig. 83; Obs. ii. 68 (1839).

Planorbis Brogniartiana, Lea, Tr. Am. Phil. Soc. ix. 24; Obs. iv. 24 (1844); Tr. ii. 242 (1842).

Planorbis lenticularis, Lea, Tr. Am. Phil. Soc. ix. 6; Obs. iv. 6 (1844).

Planorbis Buchanensis, Lea, Tr. Am. Phil. Soc. ix. 6 (1844); Pr. ii. 32 (1841); Obs. iv. 6.

Paludina hyalina, Lea, Tr. Am. Phil. Soc vi. 17, pl. 23, fig. 81; Obs. ii. 17 (1839).

Planorbis exacuous, Say, Journ. Acad. Nat. Sc. ii. 166.

Shell lenticular, light transparent horn color; whorls four, flattened so that the width of each is at least twice its depth, the upper and lower surfaces convex, and brought to a sharp exterior edge; the last half of the outer whorl deflected, so that the termination of the sharp edge is on a level with the lower surface of the preceding whorl; inner whorls slightly depressed, and somewhat more rounded; suture moderately impressed; striæ of growth faint; beneath abruptly umbilicated, displaying the edges of all the whorls within; aperture very oblique and angular; edge very sharp, below running forwards a little along the umbilical edge of the preceding whorl, then crossing obliquely forwards and upwards, leaving a callus, it passes off again a little below its carinated edge. Longest diameter, one fifth of an inch; shorter diameter, three fortieths of an inch.

Fig. 746.

P. exacutus.

It is found in most brooks, ditches, and margins of ponds, which are permanent through the summer, adhering to sticks and stones.

This shell has a striking resemblance to the *P. fontana* of Europe (Lightfoot, "Phil. Trans." lxxvi. pl. 2, figs. 1–4. Montagu, "Test. Brit." 462, pl. 6, fig. 6. *Pl. nitidus*, Müll., Turt. &c.), except that the aperture is entirely below the sharp edge, instead of embracing nearly an equal portion on each side, as in that shell. It is allied to *P. deflectus*, Say; but in that the whorls are more numerous, the exterior edge much rounded, the umbilical region broader and more shallow, and the labrum also embraces but half of the lower surface of the preceding whorl. Were it among the land shells it would be a most unequivocal *Carocolla*.

I cannot but think that the name (*P. exacuous*) under which this shell appears in the "Journal of the Academy," is not exactly as was intended by the author, as it is neither a Latin word nor a Latin termination. Supposing that by a typographical error, an *o* has taken the place of a *t*, we have a legitimate term, and one very expressive of the form of the shell.

The species has been quoted from New England to Kansas and the District of Columbia.

Planorbis parvus.

FIG. 139.

Shell very much compressed, almost equally concave on both sides; whorls four; surface nearly smooth; aperture rounded.

Planorbis parvus, SAY, Nich. Encyc. pl. 1, fig. 5 (1817, 1818, 1819); BINNEY's ed. 45, pl. 69, fig. 5. — HALDEMAN, Mon. 27, pl. 4, figs. 19–23 (1844). — GOULD, Inv. 209, fig. 139 (1841). — ADAMS, Shells of Vermont, 156 (1842). — DE KAY, N. Y. Moll. 63, pl. 4, fig. 58 (1843). — ANON. Can. Nat. ii. 208, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 133, figs. 223–225 (1865).

Planorbis concavus, ANTHONY, Cat. of Shells of Cincinnati, no descr.

Planorbis elevatus, ADAMS, Bost. Journ. Nat. Hist. iii. 327, pl. 3, fig. 16 (1840). — GOULD, Inv. of Mass. 207 (1841). — DE KAY, N. Y. Moll. 65.

Helix parvus, EATON, Zool. Text Book, 195 (1826).

Shell very small and compressed, discoidal, light yellowish horn color; right side nearly plane, but excavated at the centre; left side broadly concave; whorls four, almost equally exhibited on both sides, the outer one usually somewhat angulated at its circumference; surface minutely marked by the lines of growth, shining, clear; aperture rounded, rather longer than broad, not inclining to either side, its plane very oblique; lip sharp, slightly reflected on the left side; within bluish-white. Greatest diameter, one fourth of an inch; lesser diameter, one fifteenth of an inch; but generally much smaller.

Fig. 747.

P. parvus.

Animal whitish, dusky above, with a still darker line at tip of tentacula.

Abundant in brooks and ponds.

This is the smallest shell of the genus which we have, unless, perhaps, it be *P. exacutus*, which is commonly found of as small a size. It is not difficult to be recognized by its regular figure, and its very thin, compressed appearance. *P. deflectus*, *exacutus*, and *hirsutus*, all have marked peculiarities, which at once separate them from this undistinguished species.

Said to inhabit the whole of Eastern North America.

Fossil in post-pleiocene of Ottawa Valley.

Planorbis elevatus.

Shell small, whorls three or four, swelling above. with the apex sunken, deeply concave beneath; aperture slightly oblique.

Planorbis elevatus, ADAMS, Bost. Journ. Nat. Hist. iii. pl. 3, fig. 15. — GOULD, Inv. 207.

Shell small, light grass-green, translucent, faintly marked with lines of growth; whorls three and a half or four, the tube not rapidly enlarging, and considerably flattened; whole shell flat, or slightly elevated above, the tip depressed so as to form a small pit; below forming a deep, tunnel-shaped cavity, the whorls presenting an obscure angle as they revolve around it; suture deeply impressed; aperture slightly oblique, its upper edge on a level with the spire, or very slightly declining; lower edge descending considerably below the level of the under surface; portion of the preceding whorl embraced by the aperture constituting about one fifth of its circuit. Breadth, one fourth of an inch; height, one tenth of an inch.

Inhabits rivulets and pools in Norfolk and Plymouth Counties.

This shell is closely allied to *P. parvus* and *P. hirsutus*. But the first is a more depressed, discoidal shell, its upper surface more broadly and deeply concave, the lower surface very little more concave than the upper, and the aperture much more oblique. *P. hirsutus* has a still greater altitude, a very rapidly increasing tube, is deeply concave above and below, its color is lighter, and its lines of hairs, when present, afford a very marked distinction. It may possibly prove to be the immature shell of some other species.

[As will be seen by the synonymy of the last species, I consider this identical with it. — W. G. B.

Planorbis dilatatus.

FIG. 140.

Shell small, circumference carinated, flat above, convex below, and with a small, deep umbilicus; whorls three; aperture large, expanded.

Planorbis dilatatus, GOULD, Inv. of Mass. 210, fig. 140 (1841); Otia, 182. — HALDEMAN, Mon. 23, pl. 4, figs. 16–18 (1844). — DE KAY, N. Y. Moll. 66 (1843). — ANON. Can. Nat. ii. 209, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 131, fig. 218 (1865).

Planorbis dilatus, HALDEMAN, Mon. 25 (Jan. 1844).

Fig. 748. *P. dilatatus.*

Shell small, of a yellowish-green color, minutely wrinkled by the lines of growth; spire flat, composed of not more than three whorls, separated by a well-defined suture; the outer whorl has a sharp margin on a level with the spire, diminishing near, but still modifying, the aperture; below this line the whorl is very convexly rounded so as to encircle a

small, deep, abruptly formed umbilicus. This whorl rapidly enlarges, and terminates in a very large, not very oblique aperture, with the lip expanded so as to make it trumpet-shaped. Largest diameter, three twentieths of an inch; breadth, one twentieth of an inch.

This curious little shell was found several years since on the island of Nantucket, clinging to some damp moss, and was communicated by Mr. J. M. Earle, of Worcester. Specimens of it have also been sent to me by Professor Foreman, of Baltimore. But its characters were not fully ascertained from these few specimens. In July, 1840, Mr. T. J. Whittemore found it in great numbers at Hingham, in a small pool, southeast of the Old Colony House.

It has a miniature resemblance to *P. bicarinatus* as to its two sides, but it has only a single carina, which encircles the shell, instead of one on each side. Its large, expanded aperture, and small, deeply sunken umbilicus, readily distinguish it from any of the small species hitherto known. The surface is rather rough, and perhaps a little hispid when viewed under the microscope.

The *P. lens* of Lea ("Amer. Philos. Trans." New Series, vi. 68, pl. 23, fig. 83), which he received from near Cincinnati, is probably the same as this shell. His name, however, is preoccupied by a fossil species.

[New England to Maryland.

Genus SEGMENTINA, Fleming. 1817.

Tentacles filiform. Foot narrow anteriorly, larger behind.

Shell dextral, discoidal, spire depressed, horn colored; whorls few, visible on both sides, furnished internally with transverse, testaceous partitions or teeth; aperture transversely oval or circular; outer lip simple.

Jaws (of *S. lacustris*) very narrow, very much arched, flexible, scarcely brown, greatly attenuated, pointed. Vertical striæ or marginal denticulations hardly apparent.

Lingual membrane — ?

Segmentina armigera.

Fig. 138.

Shell flat on the right side, and concave on the left; whorls four, with minute revolving lines on the concave side; throat with five unequal teeth far within the aperture.

Planorbis armigerus, Say, Journ. Acad. Nat. Sc. ii. 164 (1818); Binney's ed. 63. — Haldeman, Mon. 30, pl. 4, figs. 11–13 (1844). — Gould, Inv. 205, fig. 138 (1841). — Adams, Shells of Vermont, 155 (1842). — De Kay, N. Y. Moll. 62, pl. 4, figs. 64 *a*, *b*, *c* (1843). — Mrs. Gray, Fig. Moll. An. pl. 310, fig. 2. — Anon. Can. Nat. ii. 205, fig. (1857).

Segmentina armigera, H. and A. Adams, Gen. Rec. Moll. ii. 264, pl. 84, fig. 4. — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 137, figs. 228, 229 (1865).

Planorbella armigera, Chenu, Man. de Conch. ii. 283, fig. 3570.

Shell small, brownish horn color, or light chestnut, orbicular; right side nearly plane, with only a slight central pit, showing four rounded volutions, distinctly separated by the suture; left side deeply concave, exhibiting all the whorls, which on this side are sub-carinated; surface shining, faintly marked by the lines of growth, and, on the left side, may be distinctly seen several raised revolving lines on each of the whorls; aperture slightly inclining to the left, rounded, and very slightly modified by the carina, very oblique; edge of lip dark brown; at some distance within the throat are five white teeth, nearly closing the passage; a large, prominent, oblique one is situated on the side of the preceding whorl, and may always be seen; a very small one is by its side; opposite to them are the three others, which are small. Larger diameter, five twentieths of an inch; smaller diameter, one tenth of an inch.

Fig. 749.

S. armigera. Enlarged.

Animal very active, of a blue-black or slate color; foot long and narrow. The shell is carried inclined at an angle of forty-five degrees. The respiratory groove is very acutely pointed.

Found abundantly in shady, stagnant pools and ditches, in which an abundance of decaying vegetable matter is immersed.

Fig. 750.

Aperture of *S. armigera.* Enlarged.

This common shell is well-marked by its external simplicity. At the same time, the complicated armature of the aperture, so unique in this family, would seem to entitle it to be arranged as a sub-genus. It differs from the preceding in having the umbilicus on the left instead of the right side, being its natural place. Mr. Haldeman proposes to make this species the type of a sub-genus, which he calls *Planorbula*.

[Ranges from the Eastern through the Middle, Western, and Northwestern States, and as far north as Peace River.

Genus ANCYLUS, Geoffroy. 1767.

Tentacles triangular, mantle included; pulmonary orifice protected by a branchial appendage. Foot large.

Shell dextral, thin, patelliform, depressed, non-spiral, apex directed to the right; aperture very wide; peritreme continuous, simple, entire.

Fig. 751.

Animal of *A. rivularis*. Enlarged.

Jaws three, covered with papillæ, one superior, small, transversely oblong, two lateral, long, very slightly arcuate, contiguous to the superior.

Lingual membrane broad; teeth crowded, numerous; central minute, narrow, simple; laterals broad, bicuspid, the inner cusp the larger.

The *Ancyli* and *Acroloxi* are widely distributed over the globe. In North America the known species are most numerous in those States where conchological observations have most been made, but an equal number may be found in other regions when they come to be explored. They are found in the extreme north and in Mexico, at every station.

The name *Ancylus* is universally adopted at the present time.

The shell of *Ancylus* is dextral, the apex being directed to the right, but the generative, respiratory, and anal orifices are on the left of the animal, as in *Planorbis*.

Ancylus parallelus.

Fig. 153.

Shell elongated-oval, sides rectilinear, apex nearer to one side, nearly central.

Ancylus parallelus, Haldeman, Mon. part 2, p. 3 of cover (1846); p. 11, pl. 1, fig. 6 (1844). — Adams, Shells of Vermont, 164 (1842). — De Kay, N. Y. Moll, 13 (1843). — W. G. Binney, Smith. Inst. L. and Fr. W. Shells, ii. 142, fig. 237 (1865).

Ancylus rivularis, Gould, Inv. of Mass. 224, fig. 153 (1841), teste Haldeman. — Anon. Can. Nat. ii. 212, fig. (1857). — Not of Say.

Shell small, narrow, elongated-oval, the sides nearly parallel, but one end is somewhat narrower than the other, and both are regularly rounded; apex nearly equidistant from both extremities, nearer to, and leaning to, one side and one end; aperture oval; color dark green. Length, one fifth of an inch; breadth, one tenth of an inch.

Fig. 752.

A. parallelus. Enlarged.

Found on stones and floating leaves in rivulets and ponds.

It is closely allied to *A. fluviatilis* of Europe; but the apex is less acute and more central. There is another American species, the

A. tardus, Say, which has been found by Professor Adams in Vermont, but which I have not yet found in this State. It is much more rounded and conical than this, and the apex is not lateral.

Ancylus fuscus.

FIG. 152.

Shell oval, depressed, convexity regular, not compressed laterally, curvilinear at the sides; apex obtuse, a little to the right and rear of the centre; epidermis coarse, brown, surpassing the margin.

Ancylus fuscus, ADAMS, Bost. Journ Nat. Hist. iii. 329, pl. 3, fig. 17 (1840); Am. Journ. Sc. [1], xxxviii. 396 (1840). — HALDEMAN, Mon. 12, pl. 1, fig. 7 (1844). — GOULD, Inv. 224, fig. 152 (1841). — DE KAY, N. Y. Moll. 13 (1843). — ANON. Can. Nat. ii. 212, fig. (1857). — W. G. BINNEY, Smith. Inst. L. and Fr. W. Shells, ii. 140, fig. 233 (1865).

Shell small, very thin and pellucid, of a rounded oval form, the entire outline regularly curved; depressed and regularly convex, not compressed at the sides; apex slightly elevated, bluntly rounded a little behind, and to the right of the centre; stages of growth visible; epidermis coarse and strong, rough, dusky yellowish-brown, extending beyond the margin of the testaceous matter, and insensibly coalescing with it on all sides, which are inclined to turn upwards; within glistening, polished. Length, three tenths of an inch; height, one twentieth of an inch; breadth, twenty-two one hundred and sixtieths of an inch.

Fig. 753.

A. fuscus. Enlarged.

Found in a rivulet in Andover by Mr. K. Prescott, of the Theological Seminary; and also found by Professor Adams in Mansfield; and by myself in Fresh Pond.

It differs from all other described species in its depressed form, its obtuse apex, and its coarse epidermis projecting beyond the margin; and, as this extends in the direction of the plane of the object to which it is found attached, and not in continuation of the convex form of the shell, the edges seem to be turned upwards. *A. parallelus* is narrower, and has the sides nearly parallel. *A. tardus*, Say, has its apex prominent, acute, and farther behind the middle.

[It has also been found in Ohio and the District of Columbia.

Class PTEROPODA.*

HEAD more or less distinct; eyes none; mouth often furnished with cup-shaped appendages. Fins two on the sides of the mouth; or two, or rarely four, on the side of the body between the head and abdomen, often furnished with a small intermediate lobe between them, apparently the rudiment of the foot of *Gasteropods*. Body ovate or roundish, often enclosed in a thin, conical, cylindrical, or sub-globular shell, with a transverse contracted mouth. Individual uni-sexual? Animal free, floating on the surface of the sea by the assistance of its fins. Nocturnal or crepuscular.

ORDER THECOSOMATA.

HEAD indistinct, with two wings on the sides of the mouth. Tooth of lingual membrane hooked, with a strong hooked tooth on each side. Gills internal. Body enclosed in a shell.

FAMILY CAVOLINIDÆ.

ANIMAL with two united fins without any posterior foot-like appendage between them. Abdomen voluminous. Gills in pairs. Internal superior organs of generation on the right side.

Shell calcareous, symmetrical, elongate, or globular.

Genus DIACRIA, GRAY. 1840.

BODY short, sometimes with lateral appendages.

Shell globular; mouth narrower than the cavity, with a slit on each side, not interrupted in front; apex often truncated in the adult

* Dr. Gould had prepared nothing on the *Pteropoda*. I am responsible for all that relates to them. The descriptions of families and genera are from H. and A. Adams.
W. G. B.

Diacria trispinosa.

Shell long, straight, anteriorly dilated, compressed on both sides, terminating posteriorly in a very long spine, and armed with a short spine on each side.

Hyalea trispinosa, LESUEUR, in BLAINVILLE, Dict. xxii. 82. — FORBES and HANLEY, Brit. Moll. ii. 380, pl. 5, fig. 3. — STIMPSON, Shells of New England, 27, no descr. (1851); Check Lists, 4 (1860).
Diacria trispinosa, GRAY, Brit. Mus. Pteropods.

This species is admitted on the authority of Dr. Stimpson, who says specimens are occasionally cast ashore at Nantucket.

FAMILY CYMBULIIDÆ.

ANIMAL globular or ovate. Fins two, horizontal, opposite on each side of the mouth, with a small intermediate lobe.

Shell cartilaginous, slipper-shaped, rarely wanting.

This family comprises four singular pelagic genera with membranous or cartilaginous shells, excepting *Tiedemannia*, which does not appear to possess any membranous envelope.

Genus PSYCHE, RANG. 1826.

BODY free, membranous, without any distinct head; tentacles none; wings two, lateral, elongate, without any intermediate lobe.

Shell very thin and membranaceous.

Psyche globulosa.

Psyche globulosa, RANG, Ann. Sc. Nat. 1st ser. v. 283 (1825). — RANG and SOULEYET, Hist. Nat. des Pterop. 72, pl. 7, fig. 5 (1852). — GRAY, Br. Mus. Pter. 28 (1850).
Euribia globulosa, GRAY, Brit. Mus. Moll. coll. EYDOUX and SOULEYET, 11 (1855).

Body round, diaphanous, mouth slightly arched, fins long, rounded at their extremity, narrowed at their base, with a light shell-case above. Viscera of a handsome purple, forming an ovoid mass, suspended in the middle of the body. (*Rang.*) St. Pierre and Miquelon.

FAMILY LIMACINIDÆ.

ANIMAL elongate, spiral; the head indistinct; mouth at the union of the two fins and intermediate lobe, with two small labial swell-

ings ; two fin-like expansions, elongate, rounded, and united at their base by an intermediate lobe bearing an operculum. Mantle large, open in front, forming a large gill cavity ; gill internal ; vent on right side of mantle.

Shell spiral, transparent. Operculum distinct, spiral, vitreous, of few whorls.

Genus HETEROFUSUS, Fleming. 1825.

Shell thin, transparent, sinistral, conical, turreted ; spire elongate, axis imperforate ; aperture angulated anteriorly, columella smooth, arcuated.

Heterofusus balea.

Plate XXVII. Fig. 349.

Limacina balea, Möller, Ind. Moll. Gr. 4 (1842).
Heterofusus balea, Mörch, in Rink's Greenl. 86 (1857). — Stimpson, Check Lists, 4 (1860).
Spirialis Gouldii, Stimpson, Proc. Bost. Soc. N. H. iv. 8 (1851) ; Shells of New England, 27, pl. 1, fig. 4 (1851).

Shell ovate-globose, vitreous, very thin, pellucid, very light, narrowly and deeply umbilicated ; spire conoid ; whorls seven, sculptured by minute, distant, impressed, revolving lines ; last whorl large ; aperture about equalling the spire, obtuse in front. Length, one tenth of an inch ; breadth, seventy-five thousandths of an inch. Whole coast of New England north of Cape Cod. (*Stimpson.*)

Massachusetts Bay, February to April (*Stimpson*) ; Greenland (*Möller*).

The figure which I have given is copied from that of Dr. Stimpson.

Heterofusus retroversus.

Plate XXVII. Figs. 345–348.

Fusus retroversus, Fleming, Mem. Wern. Soc. iv. 498, pl. 15, fig. 2.
Peracle Flemingii, Forbes, Brit. Ass. Rep. 1848, 249.
Spirialis Flemingii, Forbes and Hanley, Brit. Moll. ii. 384, pl. 57, figs. 4, 5 ; pl. M. M. fig. 1 (1853). — Alex. Agassiz, Proc. Bost. Soc. N. H. x. 14 (1865).

With the body-whorl very ventricose ; the spire of four whorls, but not forming half the length of the shell.

The following is copied from the "Boston Proceedings," l. c. : —

Mr. Alex. Agassiz made a few remarks on the habits of a species

of *Pteropod* (*Spirialis Flemingii?*) which had occurred in great abundance at Nahant during the summer of 1863. His observations of the habits of these animals agree with those of Rang and Souleyet.

They come to the surface of the water an hour after dusk; they do not remain long, and after ten o'clock at night were rarely met with. He succeeded only once in finding a few isolated specimens during the heat of the day; while at full tide, soon after dark, they were very often found in abundance. These animals are very easily kept in captivity, and their habits, which can then be carefully watched, may explain in a very satisfactory manner their sudden appearance and disappearance. As was already previously known these animals can creep about by means of their wing-like appendages. When kept in captivity it was noticed that they but rarely left the bottom during the day, merely rising a few inches, and then falling again to the bottom of the jar. After dark, however, they could all be seen in great activity, moving near the surface of the water as fast as their appendages enabled them. During the day they often remain suspended for hours in the water simply by spreading their wing-like appendages, and then suddenly drop to the bottom on folding them. This habit of remaining at or near the bottom, which they have in common with so many of our marine animals, explains undoubtedly their sudden appearance and disappearance, as they probably only come to the surface in search of food at certain hours. When the animal is in motion, beating the water like a butterfly to propel itself forwards or upwards, the shell is carried at right angles, hanging somewhat obliquely to the direction of the movement. To counterbalance this weight, an exceedingly long and powerful siphon extends on the opposite side of the animal, which is used as a kind of balance-wheel; the shell, while the animal is in motion, assuming a totally different position when it is not thus counterbalanced. Mr. Agassiz exhibited at the same time drawings of the animal in different attitudes.

The shell of this *Pteropod* resembles more *S. Flemingii* than the *Spirialis Gouldii* of Stimpson. This is the first time that a living *Pteropod* of this family has been observed on this coast.

The figures referred to are copied from the drawings made by Mr. Alex. Agassiz and kindly loaned by him.

Order GYMNOSOMATA.

Body naked, without any shell. Head distinct. Wings two or four, at the junction between the head and the body, with a central intermediate lobe or rudimentary foot? Gills exterior.

Family CLIONIDÆ.

Animal fusiform. Head with a series of conical prominences on each side. Wings two, with a central foot-like appendage between them.

In this family the conical prominences probably represent tentacular arms in a rudimentary condition; there are two genera, one, *Clione*, with the head indistinct and the tentacles defined, and the other, *Cliodita*, with the head distinct, and the tentacles not apparent.

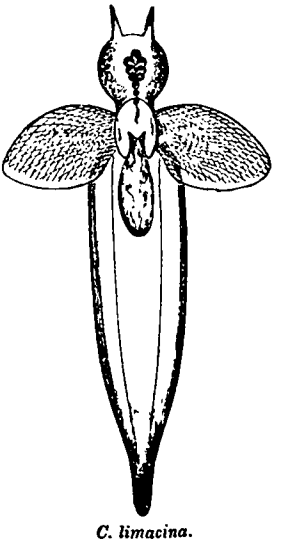
Genus CLIONE, Pallas. 1774.

Head indistinct; tentacles six, conical, three on each side. Tooth of lingual membrane broad, convex behind, slightly two-lobed and denticulated in front; lateral teeth 12–12, simple, arched, rather swollen at the base, the outer gradually diminishing in size.

Clione limacina.

Clio limacina, Phipps Voy. North Pole, 195 (1774).
Clione limacina, Stimpson, Check Lists, 4 (1860).
Clio retusa, Müller.
Clio borealis, Brug. Encyc. Méth. Vers, i. 506 (1792). — De Kay, N. Y. Moll. 6, pl. 1, fig. 2 (1843).
Clio papilionacea, Pallas.
Clio Miquelonensis, Rang, Ann. Sc. Nat. 1st ser. v. 285 pl. 7, fig. 2 (1825).
Clione borealis, Stimpson, Shells of New England, 27, no descr. (1851). — Gray, Brit. Mus. Pteropoda, 36 (1850).

Fig. 754.



C. limacina.
2/1

Gelatinous, pellucid, pale blue; mouth and end of the body scarlet out of water, hyaline; wings somewhat triangular; tail acute. (*Gray.*)

Island of Miquelon. (*Rang.*)

Fig. 754 is copied from a colored drawing by Mr. Fuller, of a specimen driven ashore at Portland last year. A full description of the animal will be found in the "Proceedings of the Portland Society of Natural History," Vol. I. Part 2, p. 85, 1869, by D. W. Wood.

Class CEPHALOPODA.*

HEAD large, separate from the body; eyes large, complex, lateral; ears developed; mouth armed with two horny or shelly jaws edged with fleshy lips, surrounded by eight or ten fleshy arms, and furnished with an entire or slit tube or siphuncle used in locomotion. Body ovate, roundish, or cylindrical, open in front, containing the viscera and one or two pairs of internal symmetrical gills; naked; surrounded by a thin shell with a single cavity; or partly or entirely contained in the last chamber of a chambered shell furnished with a siphon passing from chamber to chamber. Individual uni-sexual. Animal free, walking on its head, or swimming in the sea, propelled by the water from the siphon tube.

ORDER DECAPODA.

BODY naked. Head separate, with ten fleshy arms, the two longer arms furnished with peduncled cups with a horny circle; eyes free in the orbit. Siphuncle entire; gills two. Foot none. An internal medial shell.

FAMILY LOLIGOPSIDÆ.

EYES naked. Mantle supported by two internal fleshy bands. Siphuncle simple.

Shell solid, horny.

The members of this family have the eyes peduncled and not covered by a skin; the fins are caudal, terminal, and semi-circular; the body is membranaceous, semi-pellucid, elongate, and tapering behind. They inhabit the high seas and are powerful swimmers.

* I am responsible for all that relates to the *Cephalopods*. Dr. Gould had prepared nothing on this class. The descriptions of families, &c. are copied from H. and A. Adams. — W. G. B.

Genus LOLIGOPSIS, Lamarck. 1812.

Arms short, cups in two rows; tentacular arms slender; funnel without a valve. Pen slender, with a minute conical appendix.

Loligopsis pavo.

Plate XXVI. Figs. 341–344.

Loligo pavo, Lesueur, Journ. Ac. Nat. Sc. Phila. ii. 96, plate (1821). — De Kay, N. Y. Moll. 4, pl. 38, fig. 353 (1843).

Loligopsis pavo, Férussac and D'Orbigny, Hist. Nat. des Ceph. 321, pl. 4, figs. 1–8 (1835–1848). — Gray, Brit. Mus. Ceph. 40 (1849). — Stimpson, Check Lists, 6 (1860).

Sac much elongated, rounded; eyes very large; arms very short, depressed; fin cordate, terminated in a point; bone very narrow anteriorly, somewhat dilated posteriorly, and sub-gelatinous. (*Lesueur.*)

This species has been catalogued from New England (*Stimpson*); New York (*De Kay*).

The figure referred to does not agree entirely with Lesueur's description and figure, especially in the shape of the fins. It is principally from the peculiar "ocellations" of the surface that I believe my figure may represent *L. pavo*. It is from a drawing by Mr. Burkhardt of a specimen taken by Professor Agassiz at Provincetown.

Lesueur's description here follows: —

This species is remarkable by its elongated, pointed, and very soft sac; by its bone, which is sub-equal in its greater length anteriorly, and enlarged toward the base, where it is terminated in an obtuse point. The fins are united and oblong-cordate, entire at the base, and spreading from the sac, which is narrow, smooth, and, as well as the head and arms, covered on every part with very large ocellations, which are connected together by smaller intermediate ones. General color, deep carmine brown; head small, eyes large, prominent, and directed more forward than laterally; neck narrow, short; arms very short, furnished with two series of suckers, supported by narrow pedicles, which are fixed upon the margin at the base of the membrane and toward the narrowest side of the sucker, which is truncated very obliquely, the larger side being exterior, and the narrower interior; they are also distant from each other;

the arms are destitute of lateral interior membranes; the large arms are thin.

I have not been able to ascertain whether this species is armed with hooks or suckers. The tips of the small arms, as well as the greater portion of the larger arms, had been cut off by the fishermen, an operation which they perform upon all they capture, for fear of receiving injury from them.

Length of the sac ten inches. The figure represents the animal at half its natural size; it was a female, the oviduct of which was exserted and pendant, as represented in the plate; it is an aggregation of small white globules, attached and sustained by a membrane. Sandy Bay. (*Lesueur.*)

Family ONYCHOTEUTHIDÆ.

Eyes naked, with a sinus above. Mantle furnished with three internal cartilages, one dorsal and two ventral. Siphuncle with a valve.

Shell solid, horny.

The fins are posterior, dorsal, and angular; the head is moderate and cylindrical; the eyes naked, with a deep lachrymal sinus at the upper edge; the ears have a well-marked longitudinal crest; the tentacular arms have a rounded group of small sessile cups at the extremity of the club; the shell is internal, horny, lanceolate, and without any air-chambers. These animals are usually termed *Squids* and *Calamaries;* they are gregarious and frequent the open sea of all climates.

Genus OMMASTREPHES, D'Orbigny. 1835.

Tentacular and sessile arms with cups and horny rings. Fins rhombic, posterior, caudal. Internal cartilage of mantle dilated below.

Shell narrow, dilated in front, with one central and two marginal ribs.

Ommastrephes sagittatus.

Plate XXV. Fig. 340.

Ommastrephes sagittatus, Férussac and D'Orbigny, Hist. Nat. des Ceph. 345, pl. 1, fig. 1–10; pl. 4, 6 (1835–1848). — Gray, Brit. Mus. Ceph. 58 (1849).

Sepia loligo, LIN. Syst. Nat. 12th ed. 1095.
Sepia media, BARBUT.
Loligo sagittata, var. β, LAMARCK.
Calmar harper, MONT.
Loligo illecebrosa, LESUEUR, Journ. Ac. Nat. Sc. Phila. ii. 95, plate (1821). — GOULD, Inv. 318 (1841). — DE KAY, N. Y. Moll. 4 (1843).
Loligo harpago, FÉRUSSAC.
Loligo Brogniartii, BLAINVILLE.
Loligo piscatorum, LA PYLAIE.
Loligo Coindetii, VERANY.

This species has been noticed at Gaspé (*Dawson*); Long Island (*Sanderson Smith*); Connecticut (*Linsley*). The figure by Mr. Burkhardt, which I have referred to it, represents a specimen taken at Chelsea by Professor Agassiz.

Gould's and Lesueur's descriptions here follow: —

This beautiful animal is occasionally seen on all parts of the shore of Massachusetts. But it is especially abundant about sandy shores, as at Cape Cod. At Provincetown I have seen them stranded upon the beach at low tide, in great multitudes. Their usual mode of swimming is by dilating their sac-shaped body and filling it with water. The body is then suddenly contracted and the water forcibly ejected, so as to propel them backwards with great rapidity. So swift and straight is their progress that they look like arrows shooting through the water. Whenever they strike the shore they commence pumping the water with increased violence, while every effort only tends to throw them still further upon the sand, until they are left high and dry. The body is beautifully spotted with colors, which seem to vary with the emotions of the animal. At one moment they are a vivid red, at the next a deep blue, violet, brown, or orange. They devour immense numbers of small fish, and it is amusing to watch their movements and see how, at a distance of several feet, they will poise themselves, and in an instant, with the rapidity of lightning, the prey is seized in their long arms and instantaneously swallowed. They, in their turn, are devoured by the larger fishes, and are extensively used for bait in the cod-fishery.

They have a single bone, if it may be so called, running the whole length of the body. It is composed of a flexible, elastic substance resembling mica, and, in this species, its form is like the double paddle of the Greenlander, only it is very slender. (*Gould.*)

Loligo illecebrosa. The body of this species is rather short, narrow, sub-equal anteriorly, terminated acutely posteriorly; fins approximated at their origin, terminated in a point, and taken together rhombiform; the two longer arms are narrow, dilated at their ex-

tremity, and furnished with two series of suckers, the eight are almost equal and provided throughout their whole length with two ranges of suckers; the arms are long, and with the head they measure two thirds of the length of the sac; the bone is very narrow in the middle, dilated at each extremity, and terminated at the inferiority by a hollow inverted cone.

Colors vivid and beautiful, passing from a brilliant red to a deep and clear blue, upon the back, the head, arms, tail, and fin, which are covered with deeper points of the same color, the under part of the body is paler, region of the eyes finely tinted with yellow.

This species is known by the name of *Squid* at Sandy Bay, and is made use of by the fishermen as bait in the cod-fishery. (*Lesueur.*)

Ommastrephes Bartramii.

Plate XXV., fig. 339, drawn by Mr. Burkhardt from a specimen in the Aquarial Gardens at Boston, is referred to this species.

Family LOLIGINIDÆ.

Eyes covered with skin, simple. Mantle with three internal cartilages, one dorsal and two ventral.

Shell solid, horny.

In this family the fins are on the sides of the hinder part of the back; the eyes are without eyelids and covered with the skin; the buccal membrane is often furnished with cups; the ears have a transverse ridge; the sessile arms have two rows of cups, the rings provided with a narrow, prominent ridge on the centre of the external surface; the tentacular arms are only partly contractile into the sub-ocular cavity, and the siphuncle is attached to the head by a double superior medial band.

Genus LOLIGO, Lamarck. 1801.

Head separate from the body. Mantle free all around. Cups of sessile arms in two rows; lateral membranes with cups on the angles. Fins posterior, dorsal, rhombic.

Shell as long as the back, pennate, edges thin.

Loligo punctata.

Loligo punctata, De Kay, N. Y. Moll. 3, pl. 1, fig. 1 (1843). — Stimpson, Check Lists, 6 (1860).

De Kay's description here follows: —

Body cylindrical, tapering, about three inches in length, and with a slight ridge along the back, caused by the internal cartilaginous support. Body ends above in an acute point. The caudal appendage or fleshy fins terminal, broadly rhomboidal, and ending in an obtuse angle, nearly half the length of the body; lateral edges rounded, perfectly smooth on both sides, attenuated at the margins. Head moderately large, depressed; neck narrowed. Eyes large and prominent. Beneath the throat a prominent elongated muscular sac, opening externally by an irregular rounded orifice or vent.

Arms ten, of which the two superior are shortest and smallest, and furnished with rounded cup-like suckers attached to the arms by a central ligament. These suckers extend to the tips, but become gradually smaller until they are scarcely visible unless aided by the lens. The same remark applies to the other arms, and it may be observed that the suckers are placed in no regular order. The second pair similar in shape, but more robust, and equal in length to the fifth or inferior pair. The third pair remarkably robust, and exceeding in length the preceding. Fourth pair longest of all, and equalling the length of the head and body; cylindrical, dilated towards the extremity, and ending in an acute tip; the suckers are arranged irregularly over the dilated part.

Mouth central, sphincter-form, partly covered by an angular membrane with six short processes resembling the arms in miniature, and, like them, furnished with minute suckers. The internal cartilaginous support smooth, thin, and translucent, resembling an ordinary quill, its superior portion being comparable to the barrel, and its broad dilated extremity to the web. The upper portion triquetrous, hollowed out beneath, carinate above, and producing a corresponding elevation externally along the back; it ends in an acute tip above. This ridge along the back becomes gradually effaced towards the lower extremity.

Color. The whole body, back of the head, fins and external parts of the arms covered with reddish rounded spots of various sizes; they are rather more sparse on the inferior surface of the sac. A row of these spots around the orbits, and behind the eyes they are

so numerous as to give a darkened red appearance to that part. The external cuticle containing these spots is easily detached, leaving the denuded part of a pearly white.

Length of head and body, 4.0 – 6.0.

This beautiful *Squid* is nearly allied to the *L. Pealii* of Lesueur; but this latter has its suckers arranged in two regular series, with the disks obliquely truncated. It has also a membrane along the lateral edges of the arms, and an acute termination of the caudal extremity.

Dr. Gould, in his valuable report on the *Invertebrata* of Massachusetts, has furnished us with an exceedingly interesting account of the habits of these animals. Their colors vary every moment from vivid red to deep blue, violet, brown, or orange. Their usual mode of swimming is by dilating their body and filling it with water; the body is then suddenly contracted and the water forcibly ejected so as to propel them backward with great rapidity, shooting like arrows through the water. They devour great numbers of small fish and crabs.

The species above described is the only one I have noticed on the coast of New York, although I think it highly probable that the six following, described in detail by Lesueur, will also at no distant day be detected on our coast. The plate referred to for the *punctata* contains a figure of the cartilaginous, or rather membranous internal support; a figure of the oral apparatus (fig. 3), and a bunch of the egg-cases, or *sea-grapes*, as they are termed in Europe, with an embryo of a *Sepia* highly magnified. This congeries I found on the northern shores of Long Island. (*De Kay.*)

Connecticut (*Linsley*).

Loligo Pealii.

Loligo Pealii, Lesueur, Journ. Ac. Nat. Sc. Phila. ii. 92, pl. 8 (1821). — De Kay, N. Y. Moll. 4, pl. 38, fig. 354 (1843). — Férussac and D'Orbigny, Hist. Nat. des Ceph. 311, pl. 2; pl. 10, figs. 17 – 21 (1835 – 1848). — Gray, Brit. Mus. Ceph. 71 (1849). — Stimpson, Check Lists, 6 (1860).

Boston (*Gray*); South Carolina and New York (*Férussac* and *D'Orbigny*).

The original description here follows: —

This species, which appertains to the fine collection of the Philadelphia Museum, was politely confided to my care for examination by the manager of that interesting and superb establishment, Mr.

R. Peale. It appears to me not referable to any of the species figured by Seba, nor of those published by Montfort.

The sac is solid, firm, cylindrical, gradually attenuated to a point, and furnished with a flat appendice anteriorly; fin terminal, more than half as long as the body, united in a point posteriorly, lateral angles rounded, lateral and posterior sides thickened, anterior side thin, surface with transverse striæ, formed by small muscles; head small, compressed, with a small transverse membrane each side below the eyes; neck small, short; eyes covered by a membrane; arms eight, of which six are sub-triangular, the two superior ones a little shorter than the second pair, which are equal to the inferior pair, third pair very strong, rounded and depressed, longer than the others, furnished with a membrane at their exterior part; all the arms furnished with two series of suckers, which are hemispherical, alternate, and pedunculated; the disks are obliquely truncated, most elevated on the exterior side, beneath indented for the attachment of the conic peduncle, they are armed with six horny brown teeth above, of which two superior ones are narrow and pointed, and the four others broader; inferiorly and upon the narrow side of the disk is a long horny, brown lamina; the two long arms are sub-cylindric, dilated at their extremity, margined on each side by an undulated membrane, upon which the peduncles of the suckers repose; four series of suckers, of which the middle series are largest, and terminated at each extremity by smaller suckers; disks hemispheric, transversely truncated, armed with a corneous circle, and having strong remote teeth, with two or three smaller intervening ones in the central disks; but I have not been able to determine the number of intermediate teeth in the lateral disks; besides the thin lateral membrane there is another thicker one, placed obliquely upon the enlarged extremity of the long arms; the opening of the mouth has three concentric folds, the exterior one of which is furnished with a much folded membrane, which is terminated by six small appendices, or false arms, furnished with several suckers at their extremities, the two inferior appendices shorter.

The bone is broad, naviculiform, terminated in a point at each extremity, thin at the margin, carinated, and a little more robust at the anterior extremity, which is narrowest.

The superior part of the head, of the tentacula, and of the back covered with reddish-brown points, which are less numerous upon the sides and abdomen.

Coast of South Carolina? (*Lesueur.*)

Family SPIRULIDÆ.

Eyes covered with the skin, with a lower eyelid. Buccal membrane without cups. Sessile arms triangular, tapering. Cups numerous, equidistant, very small, slightly pedicelled, in six longitudinal series. Tentacular arms elongate, peduncled, cylindrical; club — ? Siphuncle conical, with an apical valve.

Body sub-cylindrical, oblong, end rounded, sometimes furnished with a thickened belt, and with a small fleshy semi-lunate fin on each side. Mantle free all around; cartilage, on the inner side of the ventral surface, linear.

Shell internal, shelly, spiral, chambered; chambers furnished with a siphon; the last chamber large enough to contain but a very small part of the animal.

In the only recent genus, *Spirula*, the apex of the shell is simply hooked; in the fossil genera it is enveloped in a thickened laminal coat produced behind, as in *Spirulirostra*.

Genus SPIRULA, Lamarck. 1799.

Fins two, small, caudal, on the side of the extremity of the back. Eyes large. Cups of sessile arms in six longitudinal rows; rings entire, or very minute, and denticulated; third and fourth arms shortly webbed, the rest free. Siphuncle with an apical valve.

Shell calcareous, cylindrical, conical, tapering, involute on the same plane, the whorls separate from each other and chambered; septa concave outwards, with a shelly funnel-shaped siphon on the inner or most curved side, traversing each cell without communicating with each other.

Spirula fragilis.

Nautilus spirula, Lin.; Blainv. Mal. pl. 4, fig. 1; Encyc. Méth. 465, fig. 5.
Spirula fragilis, Stimpson, Check Lists, 6 (1860).
Spirula Peronii, Lam. An. sans Vert. — Gould, Inv. 317 (1841). — De Kay, N. Y. Moll. 5, pl. 35, fig. 8 (1843).

This is the only species of the genus known. It inhabits the open sea, and is sometimes found, after storms, upon the shores of Nan-

Fig. 755.

S. fragilis.

tucket. The shell is white and pearly, coiled up in two or three turns, which do not touch each other, something like a ram's horn. The surface exhibits constrictions, at short intervals, each of which corresponds to an internal partition, so that the whole shell is divided off into chambers, having a tube, however, at one side, so that the whole are in communication. (*Gould.*)

The specimen figured is from the cabinet of E. R. Mayo, Esq. It is from Nantucket.

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THE END.

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PLATE XVI.

Fig. 227 from a drawing by Mr. Burkhardt, the others by Mr. B. F. Nutting.

Figs. 214 – 217. **Embletonia remigata.**

Figs. 218 – 221. **Calliopæa fuscata.**

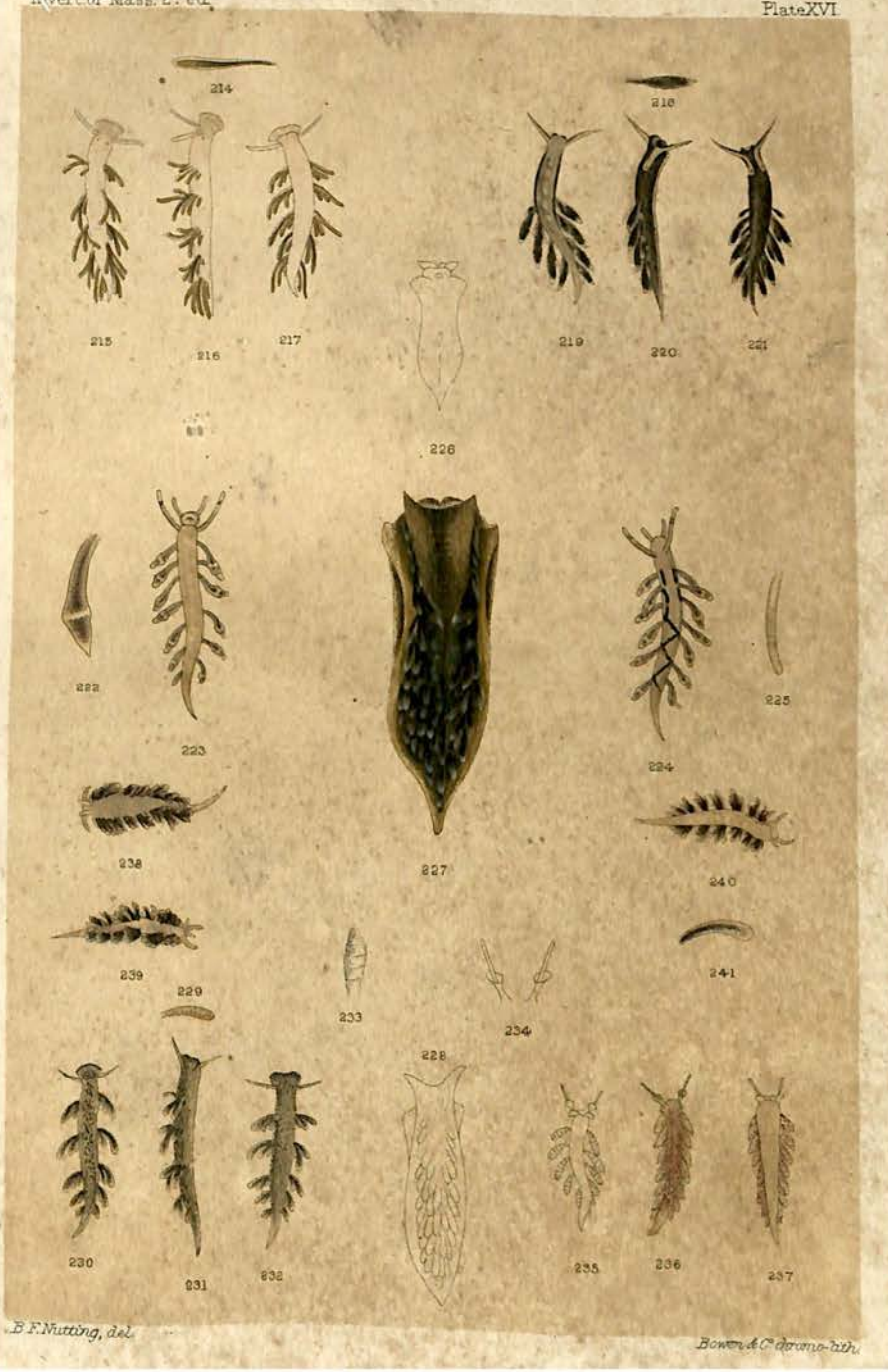
Figs. 222 – 225. **Eolis despecta.**

Figs. 226 – 228. **Alderia Harvardiensis.**

Figs. 229 – 232. **Embletonia fuscata.**

Figs. 233 – 237. **Doto coronata.**

Figs. 238 – 241. **Eolis gymnota.**



B. F. Nutting, del.

Bowen & Co chromo-lith.

PLATE XVII.

Fig. 242. **Polycera Lessonii,** side view; from a drawing by B. F. Nutting.

Fig. 243. The same, tentacles.

Fig. 244. The same, under surface.

Fig. 245. The same, upper surface.

Fig. 246. The same, branchial plume.

Fig. 247. The same, upper surface; from a drawing by Toppan of a Boston Harbor specimen.

Fig. 248. The same, branchial plume; from a drawing by Toppan.

Fig. 249. **Placobranchus catulus,** — from a drawing by Toppan of an East Boston specimen, — under surface.

Fig. 250. Same as last, upper surface.

Fig. 251. **Elysia chlorotica;** from a drawing by Dr. Gould.

Fig. 252. The same, unfolded.

Fig. 253. The same, outline of head.

Fig. 254. The same; from a drawing by Toppan of a Chelsea specimen.

Fig. 255. Same as last.

Fig. 256. **Hermæa cruciata;** from a drawing by Alex. Agassiz of a Naushon specimen.

On Stone by Mary Peart. Bowen & Co. Boston Lith.

PLATE XVIII.

Fig. 257. **Eolis farinacea,** Gould (= *papillosa*); from a drawing by B. F. Nutting.

Fig. 258. **Eolis papillosa,** eggs; from a drawing by Toppan.

Fig. 259. **Eolis farinacea;** from a drawing by B. F. Nutting.

Fig. 260. **Eolis farinacea,** tip of lingual membrane; from a drawing by Dr. Gould.

Fig. 261. **Eolis papillosa;** from a drawing by Toppan of an East Boston specimen.

Fig. 262. **Eolis farinacea,** one of the branchiæ; from a drawing by B. F. Nutting.

Fig. 263. **Eolis farinacea,** outline showing the arrangement of the branchial papillæ; from a drawing by B. F. Nutting.

Fig. 264. **Eolis salmonacea;** from a drawing by B. F. Nutting.

Fig. 265. Same as last.

B. F. Nutting del. Bowen & Co. Boston lith.

PLATE XIX.

From original Drawings by B. F. Nutting.

Fig. 266. **Eolis Bostoniensis.**

Fig. 267. **Eolis diversa.**

Fig. 268. **Eolis diversa.**

Fig. 269. **Eolis rufibranchialis,** one of the branchiæ.

Fig. 270. **Eolis pilata.**

Fig. 271. **Eolis stellata,** one of the branchiæ; from a drawing by Dr. Stimpson.

Fig. 272. **Eolis rufibranchialis.**

Fig. 273. **Eolis Bostoniensis,** one of the branchiæ.

Fig. 274. **Eolis Bostoniensis,** under surface.

Fig. 275. **Eolis Bostoniensis,** upper surface.

Fig. 276. **Eolis diversa,** one of the branchiæ.

Fig. 277. **Eolis pilata,** profile and apex of one of the branchiæ.

Fig. 278. **Eolis stellata;** from a drawing by Dr. Stimpson.

Fig. 279. **Eolis pilata.**

Fig. 280. **Eolis diversa.**

Fig. 281. **Eolis pilata,** under surface of head.

Fig. 282. **Eolis picta,** upper, side, and lower view; enlarged view of dorsal tentacles and branchiæ.

Fig. 283. **Eolis Bostoniensis,** under anterior surface.

PLATE XX.

Fig. 284. **Doris pallida,** Agassiz; from a drawing by Toppan.

Figs. 285, 286. Eggs of **Doris coronata,** Agassiz; from a drawing by Toppan.

Fig. 287. **Doris pallida,** from Beverly; from a drawing by Toppan.

Fig. 288. The tentacle of the last.

Fig. 289. **Doris tenella;** from a drawing by Toppan of a Beverly specimen.

Fig. 290. The tentacle of the last.

Fig. 291. Enlarged view of the spicula of **Doris pallida;** from a sketch by Dr. W. Stimpson.

Fig. 292. The same of **Doris grisea;** from a sketch by Dr. Gould.

Fig. 293. **Doris tenella;** from a drawing by Toppan.

Fig. 294. **Doris planulata;** from the figure in the "Marine Invertebrata of Grand Manan."

Fig. 295. **Doris grisea;** from an original drawing of Dr. Stimpson.

Fig. 296. Same as Fig. 294.

PLATE XXI.

Fig. 297. **Doris coronata,** Agassiz; from a drawing by Toppan of a Beverly specimen.

Fig. 298. **Doris diademata,** Agassiz, the branchial plumes; from a drawing by Toppan.

Fig. 299. **Doris coronata,** Agassiz, the anterior under surface.

Fig. 300. **Doris diademata,** Agassiz; from a drawing by Toppan.

Fig. 301. **Doris diademata,** an enlarged view of tentacle.

Fig. 302. **Doris diademata,** an enlarged view of the tentacle sheath.

Fig. 303. **Doris diademata;** from a drawing by Toppan.

Fig. 304. **Doris diademata,** an enlarged view of tentacle.

Fig. 305. **Doris bilamellata,** spicula; from a drawing by Dr. Stimpson.

Fig. 306. **Doris bilamellata;** from a drawing by Toppan of a Beverly specimen.

Fig. 307. **Doris bilamellata,** enlarged view of branchial plume; from a drawing by Toppan.

Fig. 308. **Doris bilamellata,** the branchiæ enlarged; from a drawing by Toppan.

Fig. 309. **Doris bilamellata,** enlarged view of tentacle; from a drawing by Toppan.

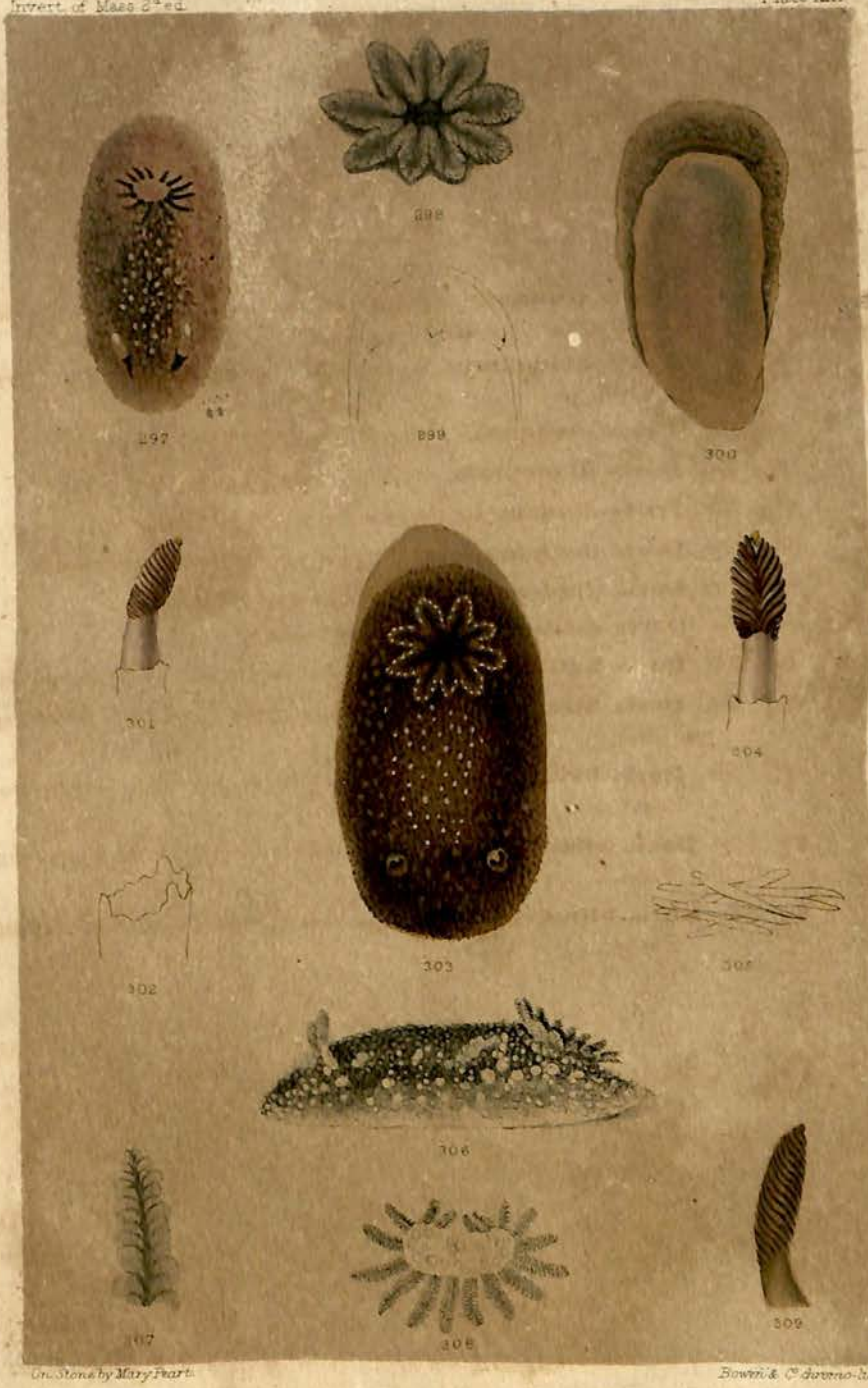


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PLATE XXII.

Fig. 310. **Ancula sulphurea,** dorsal tentacle enlarged; from a drawing by Dr. Stimpson.

Fig. 311. **Dendronotus arborescens,** — from a drawing by B. F. Nutting, — greatly enlarged.

Fig. 312. The same, under surface of the head.

Fig. 313. The same, dorsal tentacle.

Fig. 314. **Ancula sulphurea;** from a drawing by Dr. Stimpson.

Fig. 315. **Molgula producta;** from a drawing by Mr. Burkhardt.

Fig. 316. The same.

Fig. 317. **Glandula mollis;** from a drawing by Mr. Burkhardt.

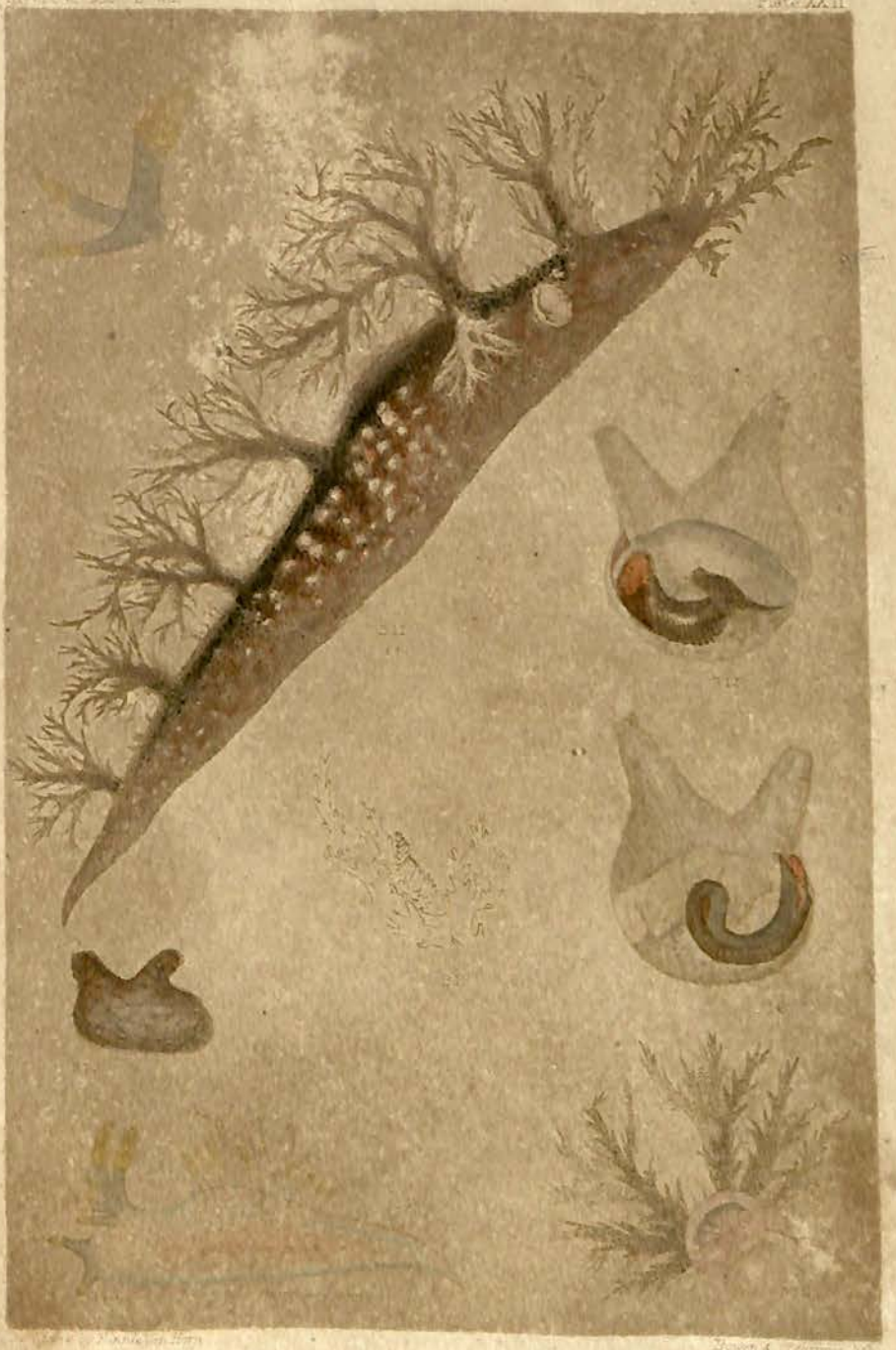


PLATE XXIII.

All drawn by Mr. E. S. Morse, from Specimens collected by Dr. Packard, and preserved in Alcohol.

Fig. 318. **Ascidia callosa.**

Fig. 319. **Botryllus Schlosseri.**

Fig. 320. **Cynthia pyriformis.**

Fig. 321. The same enlarged.

Fig. 322. **Cynthia placenta.**

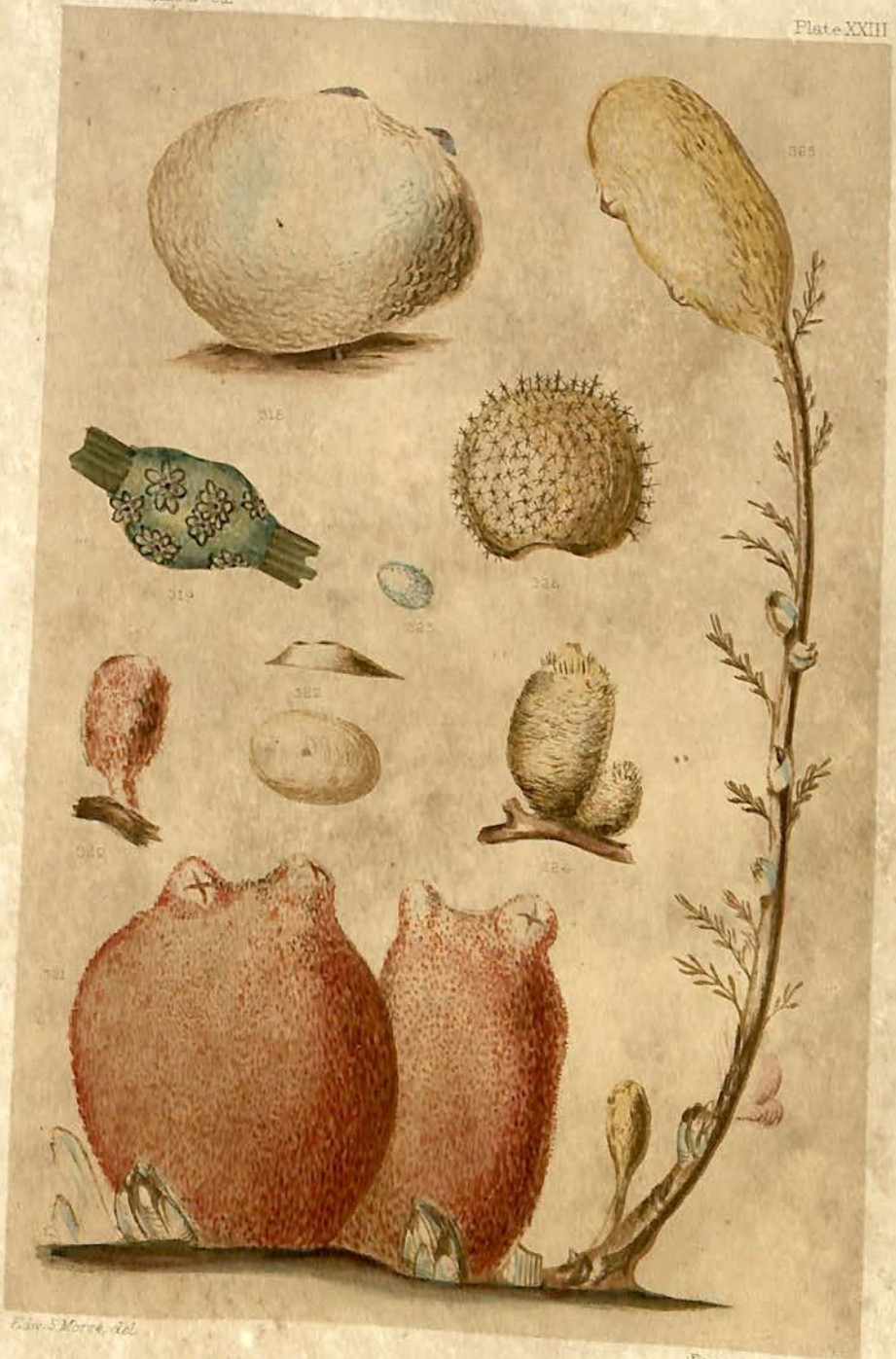
Fig. 323. **Glandula fibrosa.**

Fig. 324. **Cynthia condyiomata.**

Fig. 325. **Boltenia clavata.**

Fig. 326. **Cynthia echinata.**

Plate XXIII



Edw. S. Morse, del.

Bowen & Co. direxit lith.

PLATE XXIV.

ALL THE FIGURES DRAWN BY MR. J. BURKHARDT.

Fig. 327. **Boltenia Burkhardti,** from a specimen living in the Aquarial Gardens, Boston, 1859. Also found living at the same place, June, 1860.

Fig. 328. **Glandula mollis.**

Fig. 329. The same.

Fig. 330. **Ascidia psammophora,** from the original specimen.

Fig. 331. The same.

Fig. 332. **Ascidia ocellata,** from the original specimen, New Bedford, Dec. 5, 1848.

Fig. 333. **Ascidia amphora,** from the original specimen.

Fig. 334. **Ascidia carnea,** enlarged, from the original specimen.

Fig. 335. The same, natural size.

Fig. 336. **Cynthia hirsuta,** from the original specimen of *Ascidia hirsuta.*

Fig. 337. **Boltenia rubra.** The drawing being too long for the plate, the peduncle has been given in sections; the lower space represents three inches, the upper four inches.

Fig. 338. **Boltenia microcosmus.** In this, also, a space is left in the peduncle, representing a section of five inches.

[illegible] del.

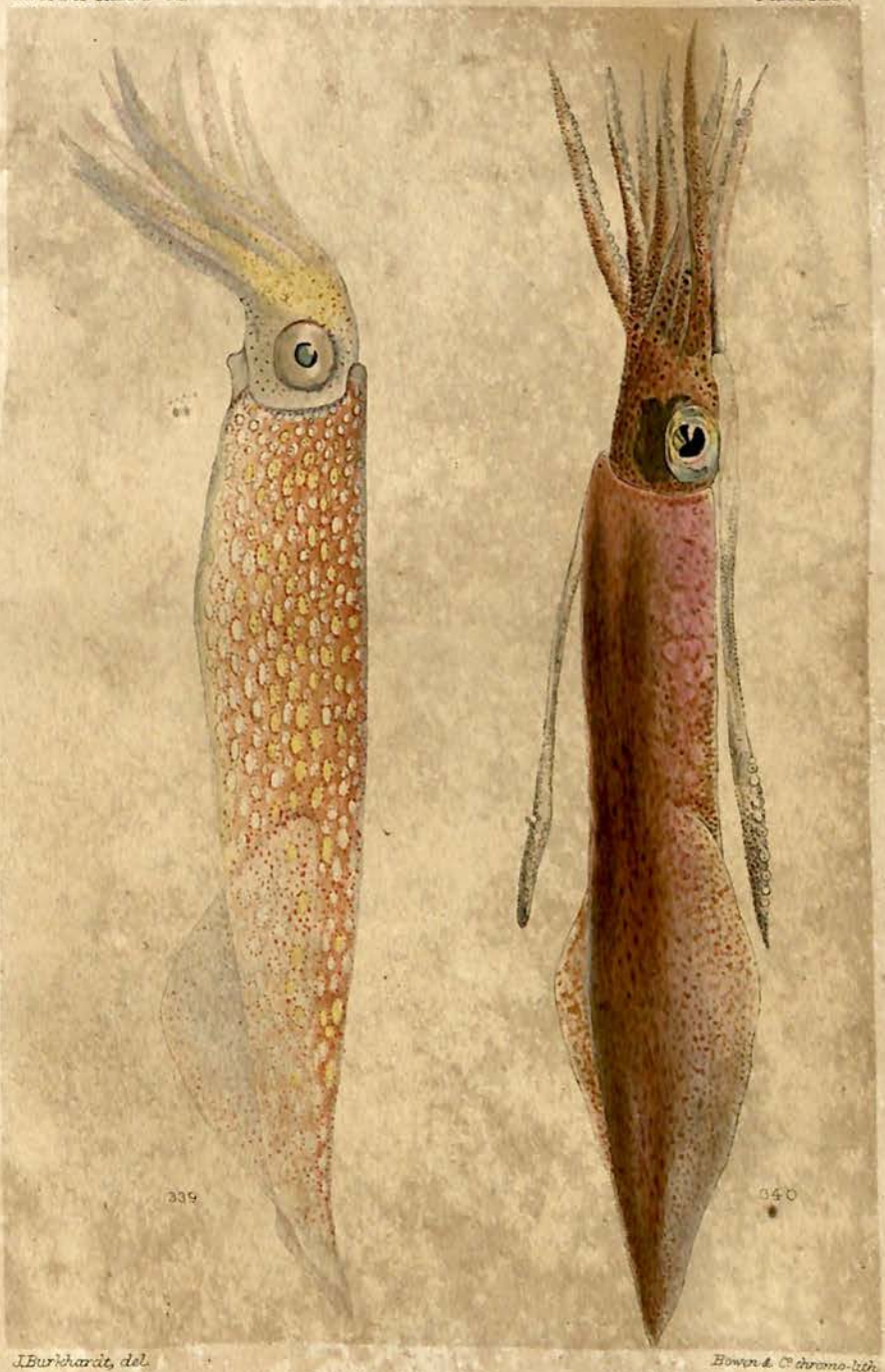
Bowen & Co. chrome-lith.

PLATE XXV.

From original Drawings by J. Burkhardt.

Fig. 339. **Ommastrephes sagittatus,** from Chelsea, reduced one fifth.

Fig. 340. **Ommastrephes Bartramii,** from a specimen in the Aquarial Gardens, Boston, reduced one fifth.



J.Burkhardt, del. Bowen & Co chromo-lith.

PLATE XXVI.

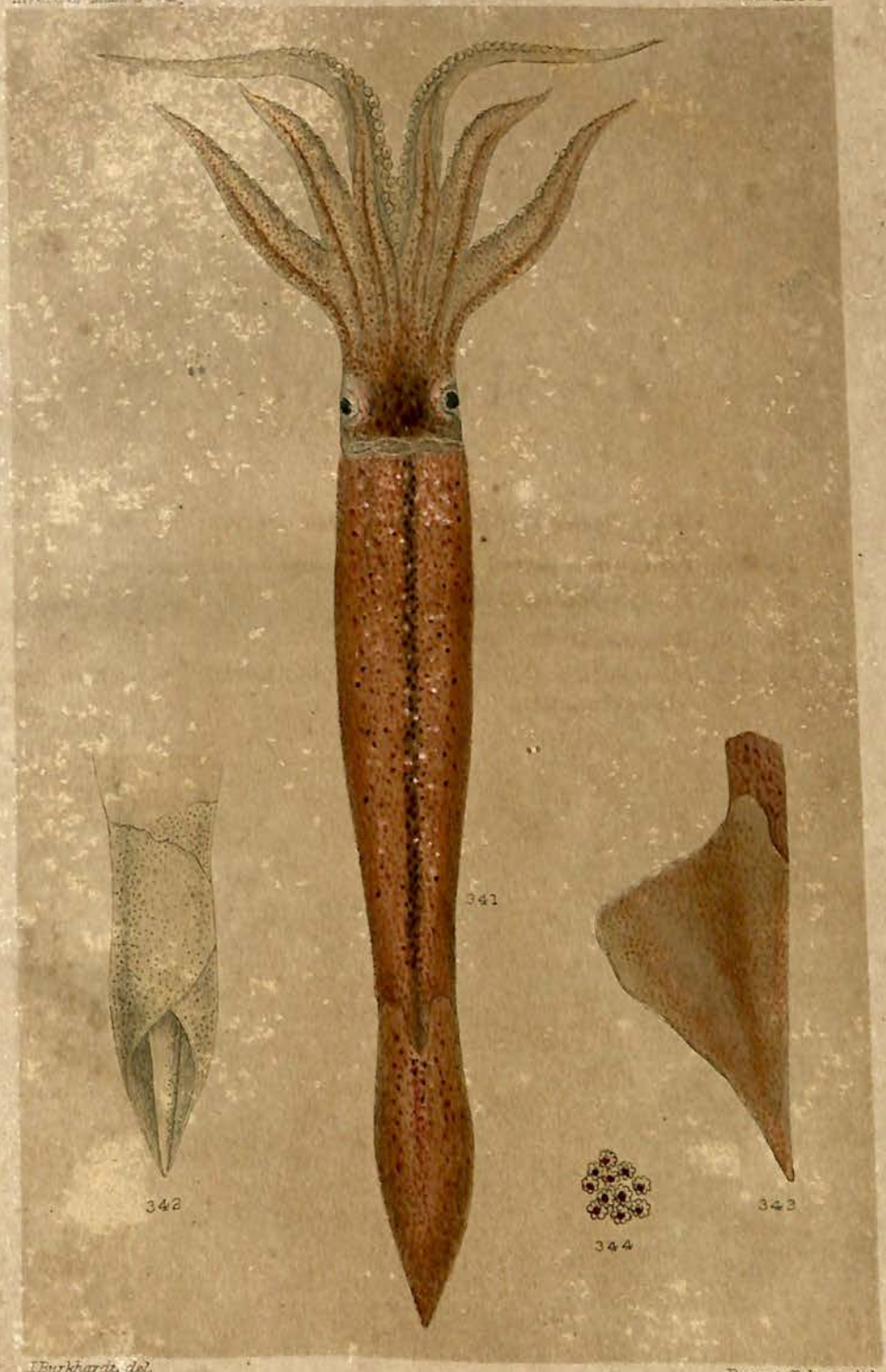
From a Drawing by Mr. J. Burkhardt, reduced one fifth.

Fig. 341. **Loligopsis pavo,** from a specimen captured at Provincetown, Mass.

Fig. 342. The same, the fins folded behind.

Fig. 343. The same, the fin expanded.

Fig. 344. The same, a portion of the surface slightly magnified to show its ocellated character.



J. Burkhardt, del.

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PLATE XXVII.

Fig. 345. **Heterofusus retroversus**; from an original drawing by Mr. Alex. Agassiz.

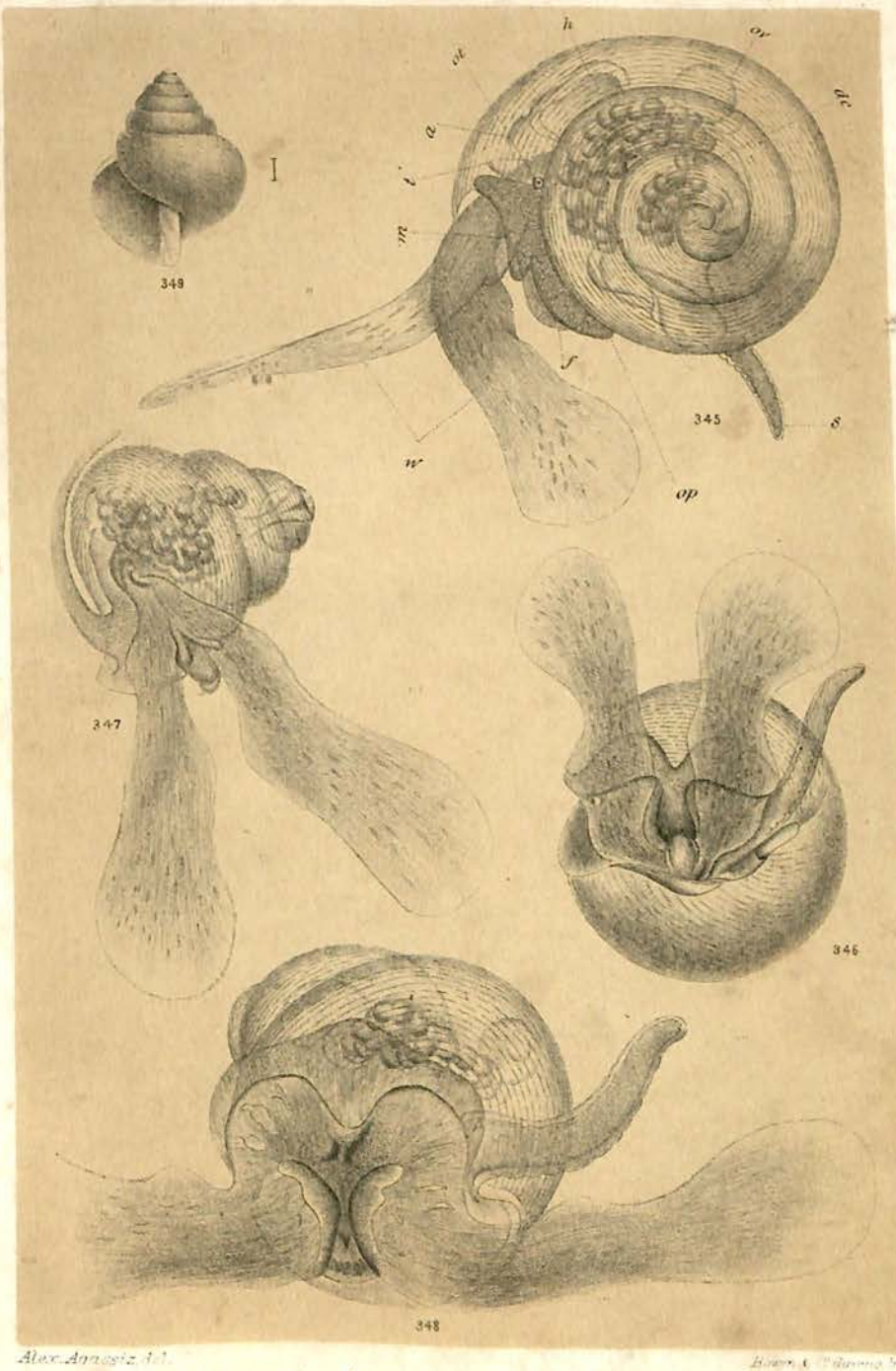
h. heart. *d. c.* digestive cavity. *op.* operculum. *m.* mouth. *a.* anus. *ov.* ovary. *s.* siphon. *w.* wings. *t.* tentacle. *ot.* otolite.

Fig. 346. The same, at rest on the bottom of the jar.

Fig. 347. The same, in rapid motion; the natural position of this figure is sacrificed to the exigencies of the plate, the shell should be much less obliquely poised, and the upper arm should be nearly horizontal.

Fig. 348. The same, floating with expanded arms, as seen from the top of the jar, when the animal is in captivity.

Fig. 349. **Heterofusus balea.** The shell, copied from Dr. Stimpson's figure of *Spirialis Gouldii*.



Alex. Agassiz del. Brown & Tilmans lith.

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